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The Institute of British Foundrymen

The Institute of Vitreous Enamellers

The Welsh Engineers' and Founders' Association

and

The Foundry Trades' Equipment and Supplies Association

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The Registered Office and Laboratories of the B.C.I.R.A. are:—
21-23, ST. PAUL'S SQUARE, BIRMINGHAM
Telephone: Central 1885. *Telegrams: CIRA*

The B.C.I.R.A. Scottish Laboratories are:—
Foundry Technical Institute, Meek's Road, Falkirk
Telephone: 332

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The Foundry Exhibition

To say that the Foundry Trades' Exhibition this year is thoroughly representative of the machinery available to the industry is obviously untrue. To be complete there should be at least fifteen stands devoted to moulding machines instead of three; again, for sand handling there should be another eight or ten stands. In certain fields, however, the Exhibition is definitely representative, even though it be incomplete. Magnetic separators and the more recent developments in airless shot-blast are specific instances. Two years ago only the tumbling-barrel type was shown, but now there are developments exhibited covering the rotary table application. For metal melting there are exhibits covering the cupola, the rotary pulverised fuel and oil furnace, electric furnaces and five major exhibits of crucible furnaces. Machinery for the core-making department is well to the fore with a number of simplified models, and in this connection it seems pertinent to remark that there has been quite a revival in the market for the cheaper type of labour-saving machines for the smaller jobbing foundries, because (we suppose) the recent boom has materially improved their buying capacity for plant. Into this category enters such plant as crucible furnaces, hand-operated moulding machines, mechanical riddles and, in general, plant that can be sold for less than a hundred pounds.

Raw materials for foundry practice are fairly well-covered by the Exhibition, especially pig-iron, from which one can reasonably deduce that famine conditions are still quite remote. If there are not many stands devoted to refractories, the area from which these are drawn is at least nation wide. Coal dust, core oils and blackings nowadays have a truly scientific background, and whilst rather prosaic as exhibits, a chat with the specialists on the stands will quickly animate the subject. The soda-ash process has developed to such an extent that its application to blast-furnace practice has to be taken very seriously, as welcome economies in the cost of manufacture of pig-iron are foreshadowed. Thus, if early promises, backed up by a wealth of experiment, are fulfilled, the repercussion is bound to be felt in the foundry industry, and eventually on the composition of the world's scrap pile.

It should be clearly understood that exhibits of general foundry interest are not confined to the section bearing that appellation, which at best is a misnomer, for it is really a foundry equipment and supplies exhibition; the actual foundry exhibition is to be found amongst the castings embodied in the hundreds of tons of machinery shown in the engineering and marine section of the Exhibition. We calculated that there are no less than 47 of the stand holders who possess their own foundries, and, indeed, quite a few exhibit actual castings. From this angle the Exhibition at Olympia is more truly worthy of such an appellation than it was when carried on as a separate entity at the Agricultural Hall.

This year, for the first time, there is included a welding section, and for the foundry executive it presents a three-fold appeal. Primarily, the manufacturer of castings to be bought by the ordinary citizen has no one to stop him from incorporating a welding department as part and parcel of his general organisation. A bath, a motor-car component, or a garden roller which has been rectified in some small manner by welding is just as acceptable as one not so treated. Next there is the general subject of mending a part broken off accidentally; this may or may not be permissible. Finally there is the general question of often what amounts to the improvement of the general appearance of an iron or steel casting. Here, of course, there are all sorts of rules and regulations, and a few frank discussions with the welding experts with a view to some relaxation during this period of high-pressure output and limited choice of skilled labour might be productive of some amelioration. This section is definitely representative of what the industry has to offer and is reasonably complete.

There are new exhibits related to the firing of mould-drying stoves, core ovens and the like, and a special oil-fired arrangement for heating up ladles and shanks. An exhibit for the drying of sea-sand and the like must rank amongst the most thermally-efficient furnaces ever seen, so far as the utilisation of the products of combustion is concerned. Information bureaux have been organised by the Institute of British Foundrymen, the Institute of Welding and our own organisation. These constitute meeting places for the exchange of information amongst members of the industry.

There are a considerable number of exhibits showing the latest developments in portable power-driven tools, and a fair proportion of these are applicable either in the fettling department or the pattern shop.

To complete the Exhibition there are exhibits by the Department of Scientific and Industrial Research, the gas industries, scientific instrument firms and the nickel and aluminium interests. All these are sources of valuable information on fundamental aspects of foundry practices, and new developments.

Every available square inch of Olympia has been let, and the variety of the exhibits is such that no foundry executive can afford not to pay an extended visit.

Uncertain Copper Outlook

BY ONLOOKER.

The rally in copper which took place in early August seems to have been an ill-judged affair, for this metal has given a sorry account of itself since, in spite of the fact that in the United States the domestic price has been maintained at 14 cents through all the turmoil which has been experienced on Whittington Avenue. Undoubtedly this has had a steadying effect, and at present it is putting a brake on the downward trend, for there comes a time when consumers in America are tempted into buying futures in London as a hedge against their requirements in physical copper. As a matter of fact the position in America is not any too clear, for although August was a busy month—sales totalled about 60,000 short tons—opinion is not so optimistic as it was about the immediate future, and it may be that the autumn will prove to be a disappointment. Producers are now well sold and consumers are, of course, covered well ahead, so that to some extent there is something of a deadlock which may not be too easily resolved.

In August, when the London market was careering upwards, a section of the American producers refused to be stampeded into what they believed would prove to be an injudicious rise in values. The struggle was a grim one, for the quotation c.i.f. European ports climbed up beyond 15 cents, and an increase in New York seemed certain, but the realisation that the pressure was being resisted in the States broke the speculative ramp in London and brought about a sharp collapse. There really seems little doubt that powerful interests in London tried hard to compel an advance in New York, but they failed, and now it looks as if there is a movement afoot to lower the American quotation. There have been rumours that a fall was imminent; so far this has not eventuated, but buying across the Atlantic has dwindled and users there are now playing a waiting game. So conditions have arrived at something approaching stalemate, business on the London market is very quiet, with a seesaw tendency, which certainly does not encourage anyone to take much interest in the metal. There is certainly no bull account of any magnitude open, and the bear account was probably almost entirely liquidated early this month, when a modest rally took place.

The profits at present being earned by copper mining companies are ample proof that the present price level is entirely adequate from their point of view, and it is obvious that quite a considerable fall could take place in the quotation without bringing about any slowing down in output on the score of unprofitable working. Nevertheless, it is thought that the producers are not anxious to see the price much, if any, lower than it is at the present time, and to this end the extra American interests who combined to bring about a measure of curtailment when things looked so bad are understood to have put a check on the policy of unrestricted production which was adopted by them at the beginning of this year. At any rate, the monthly figures published in the States show that a reduction in output made itself shown in July, and through this a check is being given to the rising tendency of stocks. Nevertheless, the impetus given to copper production by a high price level will take some time to spend itself, and more copper must be expected during the ensuing months. Stocks in this country, for example, are growing, but 20,000 tons is far from adequate, and three times that quantity would not be amiss in view of the annual volume of business on the Metal Exchange. This year will, it is said, see a record world output of copper, but there is no need to be alarmed about this if one remembers that consumption is running very high and in some directions is still expanding slightly. Probably a gradual decline in values is the most likely development in the near future, but there is little doubt that recoveries will occur on the way down.

All-Malleable Iron Fencing

BY OUR AMERICAN CORRESPONDENT.

An important development in iron fence fabrication and erection has been accomplished recently by foundrymen in co-operation with engineers of the New York City Park Department. Complete malleable-iron fence posts have been designed, including the rail cross-fittings and the post finial. The posts are single units and need no assembling. Furthermore, all threading of the pipe railing sections has been eliminated. The rails are not connected to the line posts but pass directly through them, and end or corner post fastenings are made by means of small pins. The railing sections themselves are joined by means of an ingenious malleable iron dowel, which is cast in accordance with the size of pipe railing to be used, and is driven into the pipe sections, joining them tightly together. Random length pipe sections may be used, or the dowel unions staggered to suit conditions.

Until the development of this idea, iron pipe fences were constructed with an assembled post consisting of threaded pipe sections joined by means of a malleable cross casting. This casting also received the threaded rail sections. All pipe railings required accurate cutting and threading, and careful pre-erection calculations were necessary. The railings themselves were joined by a threaded sleeve. In all cases of repair or replacement of such fences due to corrosion, it was observed that the malleable cross casting remained in excellent and serviceable condition. This fact led to the design and production of the complete malleable post and dowel.

The elimination of threading results in several distinct advantages. Due to the strains set up by the threading operation, corrosion always attacks and quickly destroys threaded parts. In addition, the reduced area caused by threading greatly weakens the pipe and post. For example, area figures reveal that an unthreaded standard 1-in. pipe has a greater area, and therefore greater strength, than a threaded 1¼-in. pipe. Thus the strength desired may be achieved by the use of smaller and less expensive pipes. Obviously, too, erection costs would be reduced materially.

(*Continued from next column.*)

The British Association has been discussing many problems of specialised and general interest, but surely the National Institute of Industrial Psychology went a step too far when it claimed that men wear moustaches to cover inefficiency. When one considers what a great number of hard-headed, clear thinking business men wear some sort of a moustache that particular declaration seems rather like a piece of uncommonly bad psychology. The said moustaches of those same hard headed, clear thinking business men will bristle with antagonism against a body some of whose tenets they already find difficult to stomach. And just when the foundrymen are putting all their energies into the inauguration of degree courses and the granting of diplomas they choose that moment to state that the tendency of many people to collect degrees and diplomas is indicative of a struggle to compensate for occupational unfitness! So, you members of Development Boards and Education Committees, cease battling with the perplexities of your good works, go home to your fireside, put on your slippers, and put that in your pipe and smoke it!

"MARKSMAN."

Random Shots

The pleasantly lingering summer at last shows signs of departing, for the mornings are now quite nippy and the evenings fast drawing in. The poor foundryman, however, has few comforting prospects of cosy winter evenings by the fireside, replete with slippers, pipe and the latest detective story by Francis Everton, for the Institute of British Foundrymen see to it that he keeps up to date and fixes up a comprehensive programme of lectures, meetings, and an odd social function or two as honey to attract the busy bee.

* * *

Then there are, of course, the committees and sub-committees with which the Institute abounds, and these have to be attended by their various members these winter evenings in addition to the many other activities. "Pity the poor Committee Man" one is inclined to say, when, returning from the theatre, one sees him in the train wearily returning home with that tell-tale sheaf of minutes and agenda on his lap.

* * *

E. V. Lucas, on the other hand, has different views on this matter of committee men, for, says he, they positively revel in it. "No sooner do they enter the room," says he, "no sooner do they see the long table with its chairs, its blotting paper, and its writing paper and its agenda paper, than they are translated into a new sphere of responsibility and service where content prevails . . . for no man or woman permeated by a sense of importance can be miserable for long."

* * *

In the same essay, Mr. Lucas draws a pretty picture of the types met with on every committee and what foundrymen will not recognise a pal amongst them? "On every committee," says he, "there is a deaf member who continues to support or attack a proposal after it has been voted upon or dismissed. There is the late-comer who enters stealthily and tiptoes to his chair. There is the late-comer who enters noisily, bangs the door, and scrapes his chair on the floor. There is the early-comer who has his watch out. There is the member who must get his salutations made before he can settle down. . . . There is the clerical member who usually keeps to the point. There are several members who say everything twice or even three times. There is the seasoned member who is able to refer to the custom of all committees he has sat on and does so. . . . There is the member who begins 'With all due deference, Mr. Chairman.' There is the member who always wants to propose a vote of thanks. There is the member who is in a position to contribute special information on the point at issue. . . . There is the member with a loud voice which cuts right across the member who is speaking, and, of course, there is the member so strong that he carries the day; for in the long run one man does all." The only point on which there could be any dispute is the member so strong that he carries the day, for every individual member of every committee which ever sat, either in the foundry industry or out of it, fondly imagines that he is that man.

* * *

This year, for the first time, there is to be an International Cremation Congress in London. As it takes place at the same time as the Foundry Exhibition at Olympia, why not invite them to arrange an official visit to the Exhibition? They would see a bonny lot of fierce fiery furnaces and could get a nice thrill by standing on the charging platform and letting their imagination run riot. Incidentally, furnace builders might do a little smart salesmanship ("Marksman" only asks a modest 5 per cent. on orders for the idea).

* * *

(*Continued in previous column.*)

THE FOUNDRY TRADES' EXHIBITION AT OLYMPIA

Held as a section of the Engineering and Marine Exhibition, the Foundry Trades' Exhibition, at Olympia, London, was officially opened this morning by Eng. Vice-Admiral Sir Harold A. Brown, K.C.B. Until October 2, it will be the centre of activity for technicians throughout Great Britain. On Wednesday, September 22, the Exhibition is to be visited by the Institute of British Foundrymen, the Cast Iron Research Association, the Foundry Trades' Equipment and Supplies Association, and The Institute of Vitreous Enamellers. On the previous day, Tuesday, the guests will include the Institute of Welding and the British Acetylene Association. The day following, Thursday, has been chosen by the Institute of Metals, whilst on Friday, October 1, the members of the Iron and Steel Institute are to be present. Raw materials for the industry are well represented, but many of the important firms manufacturing foundry equipment have not taken space, owing to pressure of business. The following descriptions of the Stands are arranged in alphabetical order, the headings indicating the principal feature of each exhibit.

PROTECTIVE COATINGS AND DEGREASING

(STAND No. 16 J.)

The *Atlas Preservative Company, Limited*, Erith, Kent, are demonstrating the "Atlas" degreasing process. A model condenser—consisting of a nest of tubes housed in a clear glass cylinder—has been built for the purpose. The demonstration consists of coating the tubes with heavy grease and then degreasing them by means of this vapour process. The rapid cleansing action of the vapour will be apparent, and observers are invited to examine the tubes in order that

"ATLAS RUSKILLA" PAINT FILM MOUNTED IN TWISTING MACHINE, DEMONSTRATED BY THE ATLAS PRESERVATIVE COMPANY, LIMITED.

they may satisfy themselves that the tubes really are as clean as they appear. This process has not been adapted so far for vitreous-enamelling work.

The other main exhibit of the stand relates to "Atlas Ruskilla" iron and steel paint. It consists of painted specimens, together with mechanical models designed to demonstrate the remarkable elasticity and durability of this anti-corrosive covering. One of these models is illustrated above. It consists of a machine into which is fitted an actual film of "Atlas Ruskilla" paint (stripped from a prepared metal plate). The paint film is subjected to continual twisting, and some idea of the durability of this paint can be gauged from the fact that the film shown at this exhibition has already withstood more than one million turns without disruption.

AN INVITATION TO STAND No. 16 F

Readers are cordially invited to visit the stand of the "Foundry Trade Journal," Row F, No. 16, which will serve as an information bureau during the period of the Exhibition. Mr. Lennox Holt is in charge of the stand. Our associated journals, "The Iron and Coal Trades Review," "Sheet Metal Industries," "Metal Treatment," and "Ryland's Directory" will be available for inspection.

It is claimed for this material that, by reason of the special medium employed in its manufacture, it will withstand conditions which would render ordinary paint too short-lived to be profitable. On application, it grips the metal tenaciously, forming a tough, elastic film which resists stubbornly the attacks of industrial fumes, steam, moisture and exposure to weather. These claims would seem to be borne out by the fact that "Atlas Ruskilla" is used extensively in foundries, etc. It is available in black, white, aluminium, and a range of attractive colours. Mr. E. J. Penston is in charge of the stand.

PIG-IRON AND COKE

(STAND No. 19 D.)

William Baird & Company, Limited, 168, West George Street, Glasgow, C.2, established in 1829, are showing their well-known "Gartsherrie" and "Eglinton" brands of Scotch low-phosphorus pig-irons, which are used extensively in the manufacture of all classes of castings. In addition they show basic, hematite and high-phosphoric foundry pig-irons.

Special qualities to consumers' specifications are supplied to meet the requirements of the heavy-engineering works, hydraulic engineers, agricultural and textile machinery makers, and the light castings industry. Advice on the selection of suitable irons from their various grades for special purposes will be readily given by the representatives on the stand.

The firm are large producers of foundry coke having a very low sulphur and ash content, and samples are available for inspection. It is interesting to note that they are also makers of a special coke with a maximum ash content of 1.5 per cent., which is used in the manufacture of electrodes. Samples of anthracite coal are also shown.

PIG-IRON AND CHILLED SHOT

(STAND No. 15 C.)

Bradley & Foster, Limited, of Darlaston, Staffs, are well known as manufacturers of high-grade refined irons and of chilled shot and grit. Another department of this firm specialises in the commercial heat-treatment of castings and wrought material. The stand takes the form of a milk bar, and arrangements have been made with a well-known firm of caterers to ensure that it is appropriately furnished and the dispensing of the drinks is conducted in the approved fashion.

High-Grade Refined Pig-irons.—In addition to refined pig-irons treated by a patented degasification process, the firm's products include a complete range of refined malleable pig-irons, cylinder irons and refined alloy pig-irons containing chromium, nickel, copper, molybdenum and tungsten to suit the requirements of individual specifications. The firm manufacture in ingot form austenitic irons of the "Ni-Resist," "Nicrosilal" and "Nomag" types. "Nicrosilal" and "Silal" pig-irons are manufactured under licence from the British Cast Iron Research Association. A high-silicon acid-resisting alloy is also manufactured in ingot form. Two other brands of refined iron worthy of special notice are high-carbon steel pig-iron for use in the manufacture of semi-steel and high-strength castings in inoculated irons, and blended all-mine pig-irons which match exactly the inherent properties of cold-blast pig-irons.

Chilled Shot and Grit.—These include all the varieties and grades of chilled shot and grit used in the various operations of cleaning castings, sand-blasting, enamelling, rock boring, well drilling and stone cutting.

Heat-Treatment.—All types of heat-treatment for the trade are undertaken. This department is equipped with the most modern furnaces, and is also the Birmingham and district licensed centre for the nitrogen-hardening process.

Mr. J. H. D. Bradshaw is taking charge of the stand, and Mr. G. T. Lunt and Mr. J. E. Hurst will be available on most days.

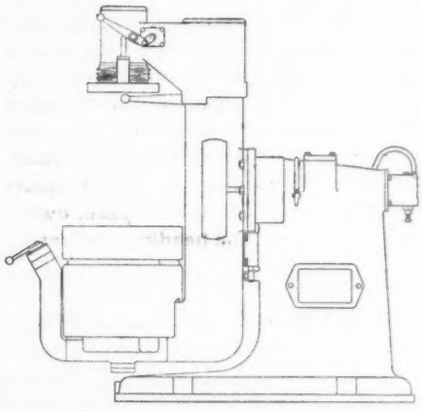
MOULDING MACHINES

(STAND No. 20 G.)

British Moulding Machine Company, Limited, of 237, Weston Street, London, S.E.1, have seven types of moulding machines on their stand, and in each case the smallest model has been chosen so as to minimise the handling of large boxes under exhibition conditions. The machines divide themselves into two main types, pneumatic and hand operated. Of the former the most important is the turnover type S.S.2, shown in outline in the accompanying drawing. It incorporates a simultaneous jolt-squeeze action and has pneumatically-controlled turnover and pattern-draw actions. The number of new

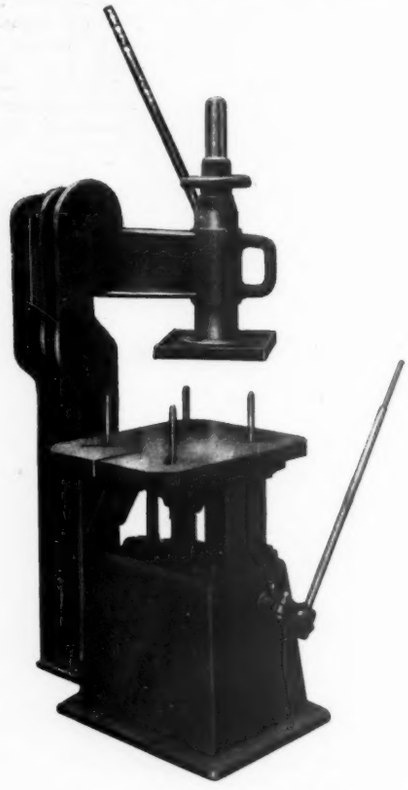
features embodied make it well worth a detailed inspection.

Entering into this category is the A.T. machine, which is also a jolt-squeeze turnover machine with an independent anvil jolter, pneumatic turnover and pattern-draw mechanism. The operation is effected by three readily accessible control levers. For making a mould, a knee-operated lever is put over to the left to



LINE DIAGRAM OF TYPE S.S.2 MOULDING MACHINE, BY THE BRITISH MOULDING MACHINE COMPANY, LIMITED.

start up the jolting, and the arm is then swung into position. A lever situated at the top of the machine is depressed and effects the squeezing action and stops the jolting. A foot lever is pushed over to the right for turning over the



TYPE S.D. HAND-SQUEEZE MOULDING MACHINE, BY THE BRITISH MOULDING MACHINE COMPANY, LIMITED.

machine. It now only remains to move the knee and hand levers, which operate the vibrator and effect the draw. The machine is returned to its original jolting position by moving the foot lever and the uppermost one. A third machine of this type (H.P.L.) dispenses with the turnover mechanism and is available in three sizes. The last of the pneumatic machines shown is a plain shockless jolter, the range available being six sizes of table.

Three types of hand-operated machines are shown, and type T.O., as the symbol indicates, carries a turnover mechanism. It is designed to take pattern plates, plaster odd sides, or indeed most types of pattern equipment. A reasonably deep draw—actually 12 in.—gives the machine a wide range of application. The rotating table carries a locking mechanism for ensuring rigidity during squeezing and drawing. The weight of the mould is counterbalanced, and the squeezing head works with a crank movement, giving a 2-in. stroke with a 5-in. adjustment. The second hand-operated machine shown is the S.D. type, which incorporates a straight lift draw. This lifting mechanism is controlled by the lever shown in our illustration, and only a small effort is needed to bring the pistons in position and lift the mould. The plate to which the pins are attached is supported on guides which work in an oil bath, and a balanced crank movement connects with the control lever. A handwheel-actuated adjustment has been provided for taking care of various depths of boxes by altering the height of the squeezing head.

Snap-flask moulding is catered for by type S.F. machine, a model which squeezes both halves of the mould simultaneously. A 5-in. adjustment to accommodate varying sizes of boxes is arranged for, and both table and squeezer head may be shifted.

The stand is in charge of Mr. V. L. Cashmore.

PIG-IRONS

(STAND No. 16 H.)

British Pigirons, Limited, of Abbey House, 2, Victoria Street, London, S.W.1, exhibit representative examples of "Midhill" and "Glenhill" all-mine special pig-iron, together with fractures, test-pieces, photomicrographs and castings. This firm are the pioneers in Great Britain in supplying pig-iron to definite guaranteed analysis coupled with the appropriate fracture. The above brands are smelted at their associated works in Scunthorpe, and are in regular use throughout the most important foundries in the engineering world. They are produced in cylinder, chilling, and special foundry qualities, and, owing to the diversified analyses of the stocks carried, the firm are in a position to give prompt delivery of pig-iron to almost any reasonable specification in these grades. It should be particularly noted that the pig-irons exhibited are *guaranteed blast-furnace products* and are not refined or subjected to any secondary thermal treatment. The company are able to supply material to meet the demands of the most discriminating users, and particularly for the production of high-grade castings subjected to the highest mechanical and pressure tests.

The technical department exhibits a comprehensive range of photomicrographs up to a magnification of 2,000 diameters, and complete pig-iron mixtures are recommended for all types of castings, on application of which service visitors are invited to make full use.

The personnel available on the stand includes Mr. T. M. Willis (director), Mr. R. A. Martin (general sales representative), Mr. I. H. Baker (Midlands representative), Mr. W. Stead (Lancashire representative), and Mr. C. R. Monseur (Belgian representative).

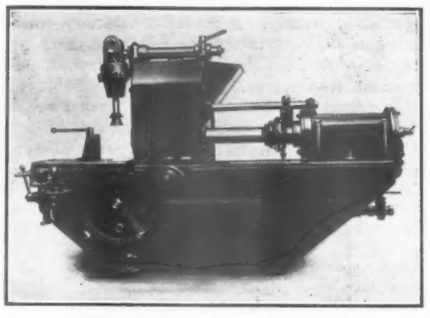
FOUNDRY PLANT

(STAND No. 19 A.)

Coleman Foundry Equipment Company, Limited, of 156, Strand, London, W.C.2, and New Icknield Way, Letchworth, Herts, again have one of the most imposing stands in the Exhibition. A number of machines which have not previously been shown will undoubtedly attract attention, and outstanding amongst these is a core cutting-off machine of novel design, and a coke-fired crucible furnace, claimed to melt 200 lbs. of metal in 35 min. with a fuel consumption of 25 lbs.

Naturally, most of the stand is taken up with moulding machines, all of which are shown in operation. An example of a split-pattern machine is shown which will take boxes up to a maximum of 22 in. square. The pattern draw is adjustable from 4 to 7 in. The machine is available with open ends and adjustable sides. A second exhibit in this line is a plain jarring machine for large cores or small moulds, which typifies a wide range of this class of machine. Several other types of power machines are to be demonstrated. Additionally, there is the "N" type of moulding machine, details of which were not available at the time of going to press.

The well-known Coleman-Prosama sand mixing and throwing machine is again being exhibited, and is, we believe, the only one of this type of machine in the exhibition. Another well-known machine is the runner-bush and riser cup machine, the installation of which allows apprentices to get on with more interesting jobs. Using only ¼-h.p. motor there is shown in operation a vibratory sand-sifting machine. Suspended from a tripod or beam this machine will deal with 5 to 10 tons per hr., depending on the mesh used.



CORE-BLOWING MACHINE, BY THE COLEMAN FOUNDRY EQUIPMENT COMPANY, LIMITED.

Finally, attention is drawn to the range of Coleman core-making machines. Available in four sizes, it is characterised as being the only horizontal core-making machine offered to the foundry public. Foundry executives are asked to bring along their own core boxes, have them "rammed up," take readings of the time necessary and examine the resultant core. This exhibit is completed by a range of such useful items as vibrators, air gun attachments and pneumatic tools. The use of a new pattern-making compound, "Tamastone," is also being demonstrated.

PIG-IRON

(STAND No. 18 A.)

Colvilles, Limited, of 195, West George Street, Glasgow, C.2, show samples of Dalzell, Glengarnock, Clyde and Monkland foundry qualities of pig-iron and Clyde special and ordinary hematite. These are in the form of pigs as cast. A series of fractures show No. 3 Clyde, No. 3 Glengarnock, Nos. 1 and 3 Dalzell special low-phosphorus, No. 4 close Dalzell foundry qualities, Clyde hematite and Clyde basic. There are also sample pigs and fractures of Dalzell special refined pig-iron, the special feature of which is its low carbon content, this being under 3 per cent. This iron is extensively used for the manufacture of high-duty castings. Several specimens of castings which have been made from mixtures of these irons are shown to demonstrate the high quality and finish obtained by their use.

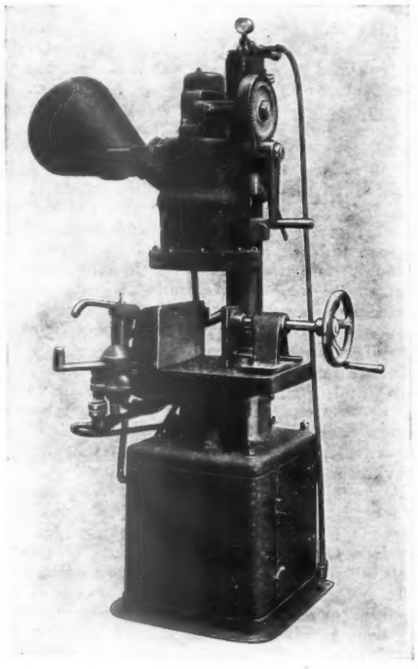
The company's representatives on the stand can be freely consulted in regard to the various foundry problems which arise, and visitors are requested to avail themselves of this facility.

FOUNDRY PLANT

(Stands Nos. 11 and 12 F.)

The Constructional Engineering Company, Limited, of Titan Works, Birmingham, 12, are showing plant for melting metal, making cores and cleaning castings.

Into the first category enters a bottom section of a cupola, showing the patented and other special features incorporated in the latest design of "Titan" cupolas. These furnaces are designed to give maximum melting efficiency with ease of operation, and there are now upwards of 2,200 "Titan" installations, having melting capacities from 1 to 18 tons per hour. It is interesting to note that, for export, the cupolas are then designed for "nesting," to minimise the freight costs. For smaller outputs the firm show a "Titan" improved cupolette. These self-contained melting plants are made in capacities of 10, 15 and 20 cwts. of metal per hour. Over 1,900 of these plants are in use in



"Titan" Core-Blowing Machine, by the Constructional Engineering Company, Limited.

foundries, engineering shops, mines, repair depôts and the like at home and abroad.

The E.G. patent spark arrester, claimed to be the most efficient arrester yet devised, is also shown. It can usually be fitted to existing cupolas, and the cost of installing is quickly recovered from the saving effected in cleaning gutters and general roof depreciation. The last exhibit in this section is the "Titan" patent crucible furnace. This is designed for using as fuel either gas, oil or coke, and is made in capacities of from 2 to 20 cwts. of metal per hour. It is suitable for melting all metals, ferrous and non-ferrous, and its special features are speed of melting, economy of fuel and freedom from metal oxidation.

Of outstanding importance is the "Sand Wizard." This patent airless "sandblast" machine, which has entirely revolutionised existing conceptions of the cost of shot blasting, is built in rumbler and rotary-table types, in a variety of sizes. A rumbler-type machine, complete with dust-extraction plant, is shown in operation. Standard sizes of rumbler-type machines range from 28 in. to 60 in. dia., whilst the rotary-table machines are made in sizes from 28 in. to 9 ft. dia. Where required, the machines can be supplied without the necessity for foundations. There are now over 550 "Sand Wizard" machines in operation.

Included in the range of ladles shown is a new drum-type design for receiving metal or for transporting molten metal, and a new type of geared ladle with a totally-enclosed oil-tight gear box. These ladles are available in capacities from 5 cwts. to 20 tons.

Many pattern-plates are being shown which are typical of the wide range of "Titanite" pattern-plates in use. "Titanite" has the appearance and durability of stone, and is now increasingly used, not only for pattern-plates, but for moulds for die cutting and for similar machines.

Amongst exhibits shown for the first time are two "Titan" core-blowing machines and a core-sand mixer and vibration table. The "Titan" core-blowing machines, shown under working conditions, will produce cores at least six times faster than similar cores can be made by hand. This machine has special features which place it in the first rank. The installation is complete with air compressor and air receiver. The "Titan" core-sand mixing machine is small, compact, but extremely efficient in operation, and is made in two sizes.

A sectional model of the Brackelsberg rotary melting furnace is being shown. This furnace is equally suitable for melting high-duty iron, steel and special alloys. It is made in capacities from ½ ton upwards for use with either pulverised fuel or oil. Constructional Engineering now hold the sole manufacturing rights for this furnace for the British Empire.

There is also shown a full range of preparations for removing slags, gases and impurities from all alloys, for the prevention of oxidation, particularly of aluminium, etc. There are also some sample die-castings made by a new process for gravity die-casting.

Finally, there are the "Titan" oil and water separators for use on compressed-air lines. These separators, which are of patented design, and entirely remove oil and water from compressed air, are made in a large range of sizes, and are suitable for all diameters of pipe-line and various pressures of air. The "Titan" gas-fired boiler is also shown.

In attendance at the stand are the following: Mr. D. H. Wood, Mr. C. H. Aiken, Mr. F. J. Barraball, Mr. W. Christoffers, Mr. L. H. Hines, Mr. J. H. Hutchinson, Mr. W. J. Molineux, Mr. J. T. More, and Mr. T. Shulte.

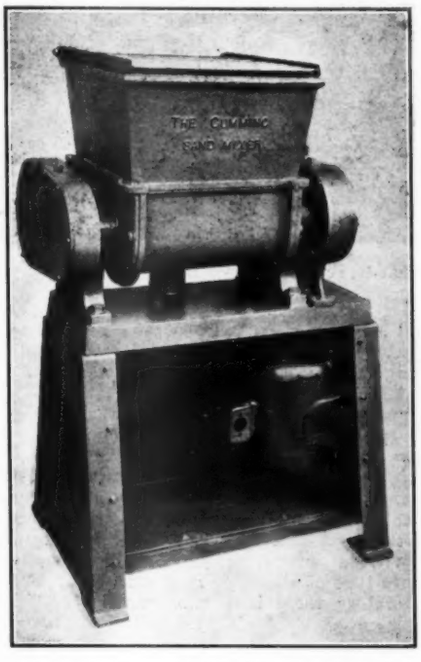
FOUNDRY PLANT AND SUPPLIES

(Stand No. 18 E.)

The old-established firm of *Wm. Cumming & Company, Limited,* who have their head office and works at Glasgow, and branches at Falkirk, Chesterfield, Bilston and Middlesbrough, are making special demonstrations, not only of their popular patent crucible furnace, but also of a hand-ram moulding machine which has already proved its capabilities in many shops throughout the country. They are also introducing for the first time a new design of oil and sand mixing machine, the efficacy of which cannot be doubted after a demonstration of its capabilities.

In addition there are on view the firm's well-known facings, plumbago, blackings, coal-dusts, core gums, core compounds, Cumming-stone, and the like, all of which are well known throughout foundries, not only in the British Isles, but throughout the Dominions

Some three years ago the firm designed the Cumming furnace, and it is satisfactory to know that the success then predicted for it has been more than justified. Hundreds of these furnaces have been installed in various countries, and in almost every case their success has been instantaneous and continuous; many firms to-day have a battery of them working in preference to the old "pit" type, the reason being that they are far more efficient and are run at a fraction of the cost, while the output is considerably increased. Various improvements have been made in the furnace from time to time. The furnace, of course, gets very hard usage owing to its rapidity of action and the speed with which the melts are turned out. This gives the linings very little chance of recovering, and therefore entails careful handling, which is not always possible in the daily rush. This is a phase which is now engaging the closest attention of the management, and researches have been made which go to show that it is possible to improve the linings in such a manner as will give them longer life and at the same time save trouble and expense in repairs. At the exhibition some special linings are exhibited which users should certainly investigate. As a matter of fact, this is about the only criticism of this furnace that has been made, and it is satisfactory to know that the



New Sand-Mixing Machine, by Wm. Cumming & Company, Limited.

makers are moving with the times and endeavouring to meet in the most complete manner users' requirements. As a speedy and effective melting unit, the furnace is certainly a great success, and it is to be hoped that the attention now being given to the linings will ensure complete satisfaction throughout.

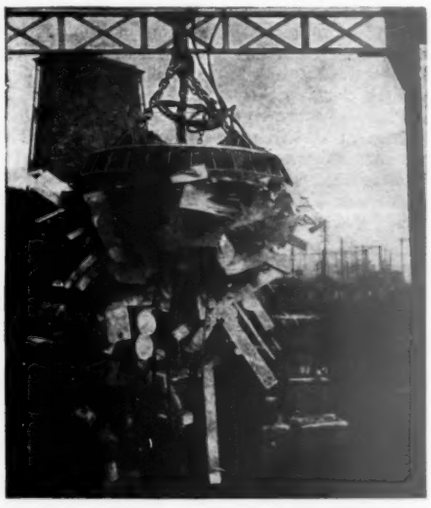
The new hand-ram moulding machine is a welcome innovation, and the demonstrations which are being given by practical men at the exhibition will show that the firm have complete faith in their production. Simple in construction, but effective in its purpose, the machine is certainly not expensive.

The latest introduction by the firm is the new sand-mixing machine. This is a compact little apparatus, and should achieve popularity amongst those smaller firms which do not require large plant. It effectively mixes up to 75 lbs. of sand, and that in a very brief space of time. It is driven by a small motor, self-contained and protected from the sand, and all the parts are carefully covered so that the customary friction and wear, which in the past have been the bugbear of founders, are entirely absent. It is a very neat looking contrivance, and should find a place in many foundries as a result of the exhibition.

MAGNETTING MACHINES

(STAND No. 17 J.)

Electromagnets, Limited, of 48, High Street, Erdington, Birmingham, cater for many sections of the foundry industry. For handling pig-iron and scrap they show a 36-in. dia. lifting magnet equipment suspended from a Morris electric pulley block, the gantry being fitted with the necessary spring drum, whilst the control is of the crank hand-operated potentiometer type. For ridding the sand of brads, spillings and tramp iron generally, new models of the Patent "Rolaflux" pulleys are shown. Whilst a magnet is now deemed to be a normal component in any mechanical sand-handling proposition, it should be more generally realised that it is also more of an essential than a luxury for foundries not in a position to install continuous plants. The next use of magnetic separators in certain grey-iron foundries is for the cleaning of vitreous enamel slip, and for this purpose a shute type of separator is shown, whilst for the laboratory there is a small model for dealing with powders. Then for the non-ferrous foundry, models for separating iron from brass and bronze borings and turnings are shown. It must be confessed, however, that, owing to extreme pressure from the manufacturing side of the business, the range of types shown is not so wide as it should have been. This feature, however, is ameliorated by the fact that the firm maintains a complete test laboratory for providing data on samples submitted in order that the correct type of machine can be designed to ensure high efficiency on any particular type of work.



HIGH-DUTY PATTERN LIFTING MAGNET, BY ELECTROMAGNETS, LIMITED.

PIG-IRON

(STAND No. 19 F.)

The *Ford Motor Company, Limited*, of Dagenham, Essex, exhibit castings made from their own brand of machine-cast pig-iron. The exhibits demonstrate the universal uses of Ford machine-cast pig-iron, and the castings of various sections and sizes which are on show include a nest of crankshafts for the well-known V-8 motor-car and a cored mould of the V-8 block. Technical representatives are in attendance to explain the diverse uses of Ford machine-cast pig-iron for all types of foundry work.

COREMAKING OILS AND MACHINERY

(STAND No. 17 H.)

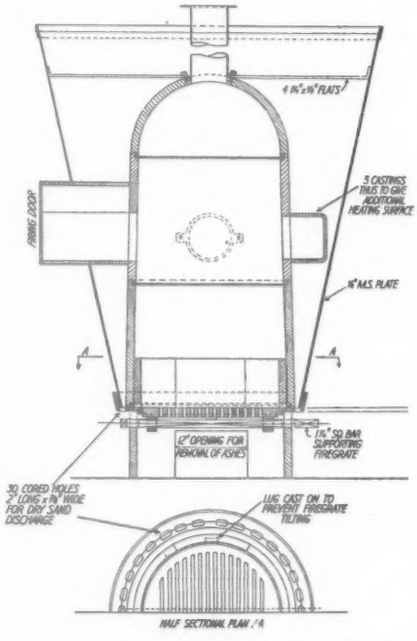
The *Fordath Engineering Company, Limited*, of Hamblet Works, West Bromwich, show a range of "Glyso" core oils and compounds, and the technical and demonstration staff, all of whom have held executive positions in foundries, will be present to advise on any sand mixtures for all types of metals, from alloy steels to the latest types of light aluminium alloys, and also on any matters relative to general foundry problems.

Both power and hand driven and Junior and Senior types of multiple rotary core machines, with dies ranging from ¼ to 6 in. diameter, are shown, together with typical sections of cores produced from these machines. The main features of the machines are speed of production, accuracy of production and simplicity.

The Senior, Junior and laboratory types of "Rotoil" mixers are exhibited, and their function is the mixing of all kinds of sands, oils, compounds, etc. Absolute silence in operation is a striking feature. The capacity of these types is respectively 3 tons, 1½ tons and 3 cwts. per hour of any kind of oil-bonded sand. Upkeep is negligible and all the machines are driven by totally-enclosed gearing.

A new design of core cut-off machine is shown for the first time. This machine has proved a valuable tool, its purpose being to trim cores accurately and quickly to any desired length, by means of a carborundum wheel. It is driven by a 1½ h.p. motor through a belt running in a V pulley. The carborundum wheel is adequately guarded, and for the determination of lengths of cores, suitable stops are fitted to an incorporated slide.

Two types of sand driers are shown, one having an output of 10 tons and the other 5 tons per day. These are a new design of the stationary type, and the accompanying line drawing indicates the main features. The firing door passes through the outer shell to the firebox, the top of which is domed so as to present a maximum of heating surface. The base of the outer shell, which is reinforced at its top edge by a stiffening band, consists of a perforated cast-iron ring through which the sand percolates. The moist sand is loaded into the conical shell, on which any size of hopper can be superimposed, and falls by a combination of desiccation and gravity through the perforations on to either the floor or bin. Such an installation is obviously low in upkeep and economical in fuel, a consumption of about 1½ cwts. of coke per day being considered normal. There are two inspection doors on opposite sides for the purpose of extracting any pebbles or other material accidentally incorporated. The firebars are cast in one piece and are supported by a 1½ in. square steel bar, which is turned at both ends and housed in the bottom casting which supports the drier. By this means the bottom casing can be rotated to aid the removal of ashes. The space occupied by the drier is a 4 ft. 9 in. diameter circle.


4 IN² x ¼" PLATES
5 CASTINGS THUS TO GIVE ADDITIONAL HEATING SURFACE
FIRING DOOR
¼" M.S. PLATE
A
A
12" OPENING FOR REMOVAL OF ASHES
℄ 1¼" SQ. BAR SUPPORTING FIREGRATE
30 CORED HOLES 2" LONG x ¾" WIDE FOR DRY SAND DISCHARGE
LUG CAST ON TO PREVENT FIREGRATE TILTING
HALF SECTIONAL PLAN AA

NEW DESIGN OF STATIONARY SAND DRIER, BY THE FORDATH ENGINEERING COMPANY, LIMITED.

Refractory coatings for cores and moulds, including steel mould paint, bath mould dressing, blackings, etc., will be on view, and full details are available. Typical cores and castings made from "Glyso" core compounds are also a feature of the exhibits.

REFRACTORIES

(STAND No. 21 G.)

The importance of refractory materials to the foundry industry will be strikingly evident on visiting the stand of the *General Refractories Group*. The design of the stand is outstanding, and unique in a respect that indicates the wide ramifications of this group of companies. On the top of the stand there has been constructed a special room in which business may be transacted.

One of the most interesting displays is that devoted to moulding and silica sands for the foundry. The company has unlimited resources of such material. The iron and steel industry is demanding considerably larger quantities through increased output, although efforts are continually made to minimise the quantity of new sand necessary in moulding mixtures. There has been a tendency to utilise more synthetic moulding sands, and in this way to ensure better standardisation than with natural sand. Yorkshire sand, for instance, is of a synthetic nature; its production being under careful laboratory control, perfect standardisation is obtained with the various grades, suitable for light and the heaviest steel castings.

Perhaps the most important advancement, however, is the discovery of Tor Rock sand. Here is a moulding sand from the Midlands which has the heavy bond, the coarse grains and the high permeability of a Scottish rock sand.

There are over fifty different grades of steel moulding sand, and iron and non-ferrous moulding sand produced by this company. These are obtainable from quarries situated throughout England and Scotland. With these facilities the founder is able to obtain the sand quickly and economically, due to low railway rates. Information regarding the most suitable type of sand for each particular need is given on request.

In addition, the company is exhibiting several types of basic and neutral refractories, including Supermag, Diazite and their new achievement in basic refractories, Saxpyre and Spinella. These bricks have a basis of chrome-spinel. They place the standard of basic-brick production in this country far ahead of anything yet achieved. In fact, extended trials have proved beyond doubt that their application will be revolutionary. These two chrome-spinel bricks, being produced of very similar composition, but with different physical characteristics, are for specific purposes. For instance, Saxpyre bricks are designed for the bottom part of the lining from the hearth to the slag line. Spinella bricks are designed for the upper structures which are subjected to conditions of greater temperature fluctuations in open hearth and electric furnaces.

Another important exhibit is of firebricks suitable for cupola linings. The bricks are manufactured at twelve works throughout the country, and thus deliveries can be executed at the shortest notice in time for quick cupola lining repairs. High-temperature cements are also being demonstrated. Of these mention may be made of Pyrolyte, Durax, Refractory Concrete and Sintex.

The year 1937 has shown a wider appreciation of the advantages of heat insulation in industrial furnaces. The application of heat-insulating bricks and cements to linings of furnaces and brick kilns was once considered to be purely experimental, and occasionally doubt was expressed as to the economies which may result. Heat insulation, however, is now accepted as a certain and essential economy, not only in saving fuel but in making possible more even distribution of heat. In fact, in some cases as much as 80 per cent. of waste heat is saved and fuel costs reduced by 20 per cent. A number of these heat-insulating bricks is shown and their advantages demonstrated.

SODA ASH

(STAND No. 16 E.)

Imperial Chemical Industries, Limited, of Millbank, London, S.W.1, and *H. A. Brassert & Company, Limited*, of 97, Cannon Street, E.C.4, have a joint exhibit, due to the fact that the latter company, following-up the soda ash process so well known in iron and steel foundry practice, have developed new methods of blast-furnace operation. An agreement has been made between the two companies for its joint exploitation and the stand has been designed to explain this new process as well as give information on the use of soda ash in foundry practice. In connection with the latter we hear rumours of extended applications, so that a talk with the experts on the stand should be worth while.

INSTITUTE OF BRITISH FOUNDRYMEN

(STAND No. 18 F.)

The stand of the *Institute of British Foundrymen* is arranged as a lounge, and it is hoped that those attending the Exhibition, particularly those connected with the foundry industry, will use the lounge as a rendezvous for meeting their friends. Members of the Institute, in particular, are urged to use the stand as a meeting place.

The exhibits consist mainly of copies of the Institute's publications, including the "Proceedings," reports of the various Sub-Committees of its Technical Committee, and copies of important Papers which have been presented from time to time. Additionally, the artistic aspect of foundry work is shown by a number of bronze art castings, including two valuable statues modelled by an eminent sculptor, who has kindly loaned them for the purpose, and some bronze plaques loaned by a member of the Institute from his private collection. Representative engineering castings demonstrate the activities of the more familiar aspect of foundry practice.

The stand is in charge of Mr. T. Makemson (Secretary of the Institute) and Mr. H. E. Purden, who will be glad to meet members and prospective members, and will be pleased to discuss membership of the Institute with the latter.

SPECIAL-PURPOSE CAST IRON

(STAND No. 15 F.)

The International Meehanite Metal Company, Limited, of Victoria Street, London, S.W.1, have the collaboration of a number of nationally-known foundries in the provision of typical exhibits. Meehanite represents the highest development in the metallurgy of cast iron in recent years. By this process the form and quality of the graphite and the structure of the matrix are always under precise and accurate control, resulting in close-grained and uniform castings of uniform properties and to exact specifications. Thus Meehanite castings possess very definite properties to which the designing engineer can work, and these properties are uniform and constant in all sections, each square inch of section taking its proportion of operating load. This fundamental conception of physical properties of castings is demonstrated on the stand.

There have been developed over 20 different grades of Meehanite metal, each having its own particular combination of physical properties and service application. These service applications fall under six headings:—(1) General engineering; (2) heat resistance; (3) abrasion and erosion resistance; (4) corrosion resistance; (5) chemical and (6) wear.

Castings and photographs are shown illustrating these applications for the following industries:—Machine tool, diesel and oil engines, laundry machinery, railway, stove plate, paper, motor vehicle, gears, heavy engineering, valves and fittings, together with special applications such as crankshafts, camshafts, and replacements for steel. Special heat-treated castings replacing costly alloy steels are also exhibited.

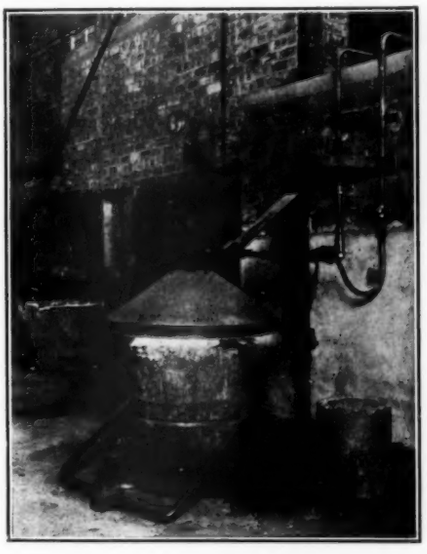
In Europe there are now 23 manufacturers of Meehanite castings, of which 11 are in Great Britain. In the U.S.A. the process has been adopted by such firms as Cincinnati Milling Machine Company, Farrel-Birmingham Company, Cooper-Bessemer Corporation, American Laundry & Machine Company, and 30 others. The output from these concerns last year was over 800,000 tons.

The Meehanite Research Institute is an organisation consolidating the research and development of all these firms, and over 250 researches have been issued on every phase of foundry activity. The types of investigation conditions are being demonstrated.

OIL-BURNERS IN THE FOUNDRY

(STAND No. 18 H.)

Laidlaw, Drew & Company, Limited, of 9, Tower Street, Leith, Edinburgh, 6, have as their main exhibit a foundry ladle heating equipment. As will be seen from our illustration, a burner (actually type H) is fitted into a hood, the whole being carried by a stanchion or the like. The



LADLE HEATING EQUIPMENT, WITH TYPE H BURNER, BY LAIDLAW, DREW & COMPANY, LIMITED.

equipment incorporates the necessary oil valve, filter, pressure gauge and lengths of flexible metallic tubing for the air and oil. The standard sizes of hood range from 18 in., rising by 6 in. to 5 ft. 6 in. A useful service is given for foundries having compressed air at 80 to 100 lbs. by the inclusion of a reducing valve in the equipment.

Oil burners suitable for core-oven heating are also shown. They are of the low-pressure fan air type, whereas the burner for the ladle heating equipment is of the medium-pressure type.

To extend the use of oil for foundries, and to reduce the installation to the simplest possible proportions, this firm has devised a system whereby a number of air and oil points can be fitted at different places in the shop, somewhat similar to power plugs for electric current, and in this connection they show a burner which is easily portable, and which, by means of flexible tubing, can be connected to these air and oil points and so be used in any part of the foundry for any purpose.

The stand is in charge of Mr. J. Duguid, and, for a limited period, Mr. A. K. West will most likely be on the stand.

MICROSCOPES

(STAND No. 13 D.)

E. Leitz (London), of 20, Mortimer Street, London, W.1, have an extremely wide range of optical instruments on their stand, ranging from the well-known Leica camera to research microscopes. The latter is known as the Panphot, and is based on the Le Chatelier system. It combines a microscope and a photomicrographic apparatus and operates with either ordinary or polarised light. It can project either macro or micro sections, and it is possible to undertake slow motion and ciné photomicrography. Moreover, it will take as an accessory a vacuum heating stage for the examination of metal structures up to 1,000 deg. C., whilst the range of magnification covers from ½ to 2,000 diameters. Now that the microscope is being regularly used in connection with sand preparation, attention is called to the Ultrapak, which has a measuring stage reading to $\frac{1}{100}$ mm. in two directions.

Vitreous enamellers will be interested in inspecting the colorimeters and the Leifco photometer, which is a multi-purpose machine, even capable of being used for *p*H determinations and for silicon estimations in cast iron and steel. Lustre and densitometry determinations are other applications.

Another piece of apparatus which commends itself as being of major interest is the Tyndallometer for measuring the dust content of the atmosphere. Direct readings are given and the apparatus is portable. Finally, there is an optical dilatometer for both absolute and differential determinations. It automatically records the behaviour of metals up to 1,100 deg. C. A new model is available for light alloy foundries which takes care of time-lags and distortion. Of course, there are other exhibits of more interest to the engineer.

CRUCIBLE FURNACES

(STAND No. 20 A.)

John Macrae, Limited, of 6, Racquet Court, Fleet Street, London, E.C.4, are again showing their coke-fired crucible furnace. This design, it will be remembered, uses a forced-draft stack. Its special feature is the way the air is introduced to the fuel bed through a grill provided with centrally and peripherally disposed apertures. This grill is dropped by the removal of two supporting round bars. The front of the ash pit is sealed by a shutter, and through it the air blast from a half horse power motor is introduced. In front of the ash pit, and attached to the casing of the furnace, is a box-like structure having a curved bottom plate and a covering plate. By removing the covering plate and lifting the shutter in front of the fire-box, the grill can be dropped and removed, and it is a very easy matter to shovel out the ashes. The furnace is economical in use and yields a long crucible life.

ELEVATING TRUCKS

(STAND No. 16 D.)

The exhibit of *Ransomes, Sims & Jefferies, Limited*, of Ipswich, is devoted to electric industrial trucks, of which they were the first British makers. It has, for some years now, been recognised that the efficient handling of goods and

materials is one of the most important factors in reducing costs, and electric trucks are eminently suited to employ for internal transport in very many instances.

The exhibits include an electric battery-driven industrial truck (Model ENU. 4); an electric battery-driven tiering truck (Model TNU. 40); an electric truck driving unit as used on the above models; and an elevating gear unit as used on the ENU. 4 truck.

MAGNETTING MACHINES

(STAND No. 16 C.)

The Rapid Magnetting Machine Company, Limited, Magnet Works, Lombard Street, Birmingham, 12, are exhibiting a range of their magnetic separators, but due to the exceptionally heavy demand they have had in the past few months for their special equipments it was with regret that they could not spare time to manufacture other machines which it was intended to exhibit. Consequently their display is not as comprehensive as was originally intended.

NEW MODEL OF "RAPID" SELF-CLEANING MAGNETIC SHUTE, BY THE RAPID MAGNETTING MACHINE COMPANY, LIMITED.

Despite this, they have managed to create a fairly extensive exhibit of machines for foundry use.

One special feature of the exhibit is the arrangement of three different types of magnetic separators mounted on one structure, and using a common hopper over a conveyor belt to feed whichever separator it is desired to demonstrate, the whole being driven by one of the firm's own type of electro-magnetic clutches. This exhibit should be of particular interest to all persons using conveyor belts for handling their materials.

They are also showing, for the first time in London, a revolutionary design of magnetic separator, known as the "Rapid" "Multi" (Prov. Pat.) self-cleaning shute type electro-magnetic separator, which, as its name implies, is suitable for dealing with a variety of materials; in fact, those that can be dealt with are legion. It is also claimed that this separator gives the nearest to 100 per cent. efficiency of extraction yet obtained. It supersedes many previous designs and embodies the features of a magnetic drum and shute-type magnet combined, but is automatic in the discharge of the extracted iron. At the same time it is claimed to be the nearest approach to a universal type of magnetic separator where the extraction of ordinary loose iron and steel other than very feebly magnetic material is concerned, and it is capable of extracting fine iron or "tramp" iron equally well.

In connection with this and other types of machines, the firm have developed a special feeding hopper for which a patent has been applied. This feed hopper gives a regular and evenly-distributed flow of material which, through special features embodied, is positively forced through, and at the same time it will satisfactorily feed both coarse and fine material together and should an occasional large piece of metal or other material inadvertently be fed into the hopper, there is an arrangement whereby this is automatically passed through without causing damage. It is made up in various sizes, according to the width of magnetic separator used, and at the same time it may be of interest to firms already using electro-magnetic separators of "Rapid" manufacture to know that this improved type of feed hopper can be fitted to their present machine and is time, labour and money saving.

They are also exhibiting their well-known type "J" drum-pattern electro-magnetic separator, which always creates great interest, and their type "V" patent vibrating shute pattern electro-magnetic separator is also in operation. In addition, they have included various designs of magnets for scrap sorting and ore testing; also magnetic chucks and one of their well-known "Rapid" "Biaflux" patent electro-magnetic drums, but only of a small size. They claim to have made the largest electro-magnetic drums in the world, and at the present time have a still larger one in course of manufacture.

SANDBLAST APPARATUS

(STAND No. 14 A.)

H. G. Sommerfield, Limited, of 7, Tavistock Place, London, W.C.1, are taking the opportunity of the exhibition to introduce a completely new system for sandblasting. The pressure chamber unit, the sump and suction feed, and the high-speed mechanism of centrifugal machines are all discarded. Continuous operation is afforded without incorporating a single moving part and the system is equally efficacious for metallic or other types of abrasive. Like most successful inventions, simplicity is the keynote in design and operation, resulting in surprisingly low prime cost and a single control. The abrasive is kept away from the compressed air until it is set in motion towards the nozzle; therefore condensation and oil troubles no longer arise.

The new system works at 15 lbs. per sq. in. and uses a $\frac{5}{16}$ in. dia. nozzle, and pressure is maintained from a single 5 in. by 6 in. cylinder of a compressor working at 420 r.p.m., and giving an output, according to maker's computation, of 25 cub. ft. of free air per min. Under the old pressure chamber system 41.7 cub. ft. of free air would have been allowed for this service.

"Graventuri" is the designation coined for the new type of sandblast, and it explains itself. The law of gravity is harnessed to the Venturi principle to help abrasive introduction into the air stream, so that only in very large plants is any form of elevator necessary. The principle of forcing abrasives upwards from the blast of a pressure chamber through the medium of an air blast is obviously wasteful of power, and "Graventuri" helps instead of hinders air flow. The abrasive itself is found to respond to a modified rule of hydraulics, and the column of shot in the hopper has its gravitational value fully exploited. The machine shown is the smallest model in production, but adequately demonstrates the new system, and patents have been applied for.

In addition to this machine, the firm is showing "Pulverite," a low-ash and high volatile content coal-dust; some protective devices for foundrymen, and a case of typical fractures of Colvilles' pig-irons, for which they act as agents in the South of England.

Mr. C. J. Nurcombe and Mr. W. J. Hooker are in attendance on the stand.

CORE OILS AND MACHINERY

(STAND No. 15 E.)

Spermolin, Limited, Union Street South, Halifax, are the pioneers of the core-oil industry in this country, having been established since 1908, and their products are well known throughout the world. Eight different grades comprising oils, creams and semi-solids are now manufactured to suit all classes of foundry work, whether iron or non-ferrous. Where Spermolin semi-solid is employed the cores have as much "green" strength as those made with ordinary clay-bonded sand. For use with core blowing machines Spermolin core compounds are extremely popular.

The Spermolin patent sand-mixing machine is again being shown. It incorporates a foolproof locking device which makes it impossible to start the machine until the safety grid is in the "closed" position, thus ensuring perfect safety for the operator. The machine is simple in construction, there being very few working parts to get out of order, and its action is rapid, a batch of oil sand being thoroughly mixed in 4 min. Two sizes are manufactured, the larger having a capacity of 2 cwts. and the smaller of 40 lbs. These can be supplied either belt-driven or direct-driven by motor through a reduction gear.

The Spermolin patent rotary core-extruding machine which is on exhibit produces round cores of any diameter from $\frac{3}{8}$ in. to 3 in. and square, oblong and hexagon cores can be produced to specification. The chief feature of the machine is the patent rising and falling tray carrier, which adjusts the tray to the exact level of and parallel to the die, thus obviating the necessity of packing up the tray and eliminating bent and distorted cores.

Shown for the first time is a plastic stone, a British product for making patterns and pattern plates, which neither expands nor contracts, and which will withstand the hardest wear. Double-sided pattern plates can be easily made and plates cast late in the afternoon can be put into operation the next day. The finish is exceedingly smooth, having the appearance of marble, and the nature of the material is such that it can be turned, chiselled, filed, drilled or scraped. Obsolete plates can be broken up and used for reinforcing others, thereby effecting a considerable saving in material. Existing plates can be added to most satisfactorily.

Amongst the exhibits shown are examples of intricate oil-sand cores, a belt-driven Major sand-mixing machine, a direct-driven Minor sand-mixing machine and a rotary core machine, and examples of patterns and single- and double-sided pattern-plates made from plastic stone.

STEEL MOULDING BOXES AND WHEELBARROWS

(STAND No. 12 D.)

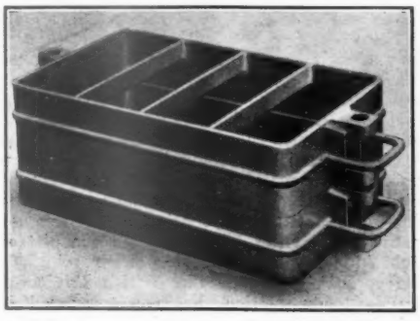
Sterling Foundry Specialties, Limited, of London Road, Bedford, exhibit a comprehensive selection of their well-known rolled-steel moulding boxes of various sizes and styles, for iron, brass, steel and aluminium foundries, and also a range of Sterling wheelbarrows suitable for foundry and other industrial purposes.

Sterling moulding boxes are made from a rolled steel bar of a special patented section, the shape of which has been designed to afford great strength and rigidity and minimum weight. The lugs and handles and other fittings on the boxes are strongly welded to the box. It is quite impossible for Sterling boxes to crack or break. The company have a large department entirely devoted to the production of these boxes, in the manufacture of which great care is taken to ensure accuracy and interchangeability. All

parting surfaces are ground level and true, and all pinholes are drilled from accurate jigs.

Sterling boxes are made to suit all purposes, and in sizes from 9 in. square by 2 in. deep each part, up to 72 in. square by 16 in. deep each part; also there are circular boxes from 12 in. dia. to 72 in. dia. They are all made to customers' specifications as regards the exact length and breadth of the box, and can be either supplied with fixed pins or arranged for use with loose pins. When required, the pin centres will be drilled to suit customers' existing pattern plates or odd-sides.

Two boxes are illustrated. The smaller box is made from the special Sterling rolled-steel section, which makes a very strong and rigid job but one that is very light and easy to handle for fast production. The larger box, 30 in. by 48 in. by 10 in. deep cope by 16 in. deep drag is a



Moulding Box made from Special Sterling Rolled-Steel Section, by Sterling Foundry Specialties, Limited.

Heavy-Duty Moulding Box for Steel-foundry Use, by Sterling Foundry Specialties, Limited.

heavy-duty box for use under severe conditions in a steel foundry. It is a fine example of sturdy construction.

Sterling wheelbarrows embody a number of important improvements such as the ten-spoke wheel, the prelubricated axle, and the construction of the legs which are fitted with renewable shoes. The Sterling general-purpose foundry barrows are made in twenty variations with capacities from 3 cub. ft. to 6 cub. ft., and having trays of various gauge thicknesses. There are in addition special-purpose barrows with trays suitable for coal, coke and pig-iron. All parts are standardised and made interchangeable for repairs and replacements.

PIG-IRON

(Stand No. 17 D.)

Stewarts and Lloyds, Limited, of Glasgow, London, and elsewhere, show samples of foundry, forge, basic and special pig-irons, the brands being "Lloyds," "S. & L.," "H.M." and "S.V.H." Their range of analysis makes them very suitable for light castings, machinery castings, and castings for the engineering, hollow-ware and building trades.

Two working models of springs made from pig-iron demonstrate the superior physical qualities of the brands of Stewarts and Lloyds' manufacture, while typical examples of products manufactured from them illustrate their adaptability to foundry requirements and the excellent surface they provide for enamel finishing. These have been supplied by Allied Ironfounders, Limited; R. & A. Main, Limited; Walter Macfarlane & Company, Limited; Emscote Foundry Company, Limited; Sydney Flavel & Company, Limited; and Crane, Limited; and consist of a Norfolk sink, heating stove, moulded gutters, luxury bath set, Sussex type gas-cooker, coat of arms decorated in heraldic colours, gas fires, gas cookers and a domestic heating boiler.

A model of the locomotive "Princess Royal" typifies the use of "S. & L." products on railways, as their pig-iron and boiler tubes were used in its manufacture. Models are also exhibited of a steel chimney, a slag ladle supplied by E. N. Wright, Limited, and of the large "Digger" built by Ransomes & Rapier, Limited, for Stewarts and Lloyds' mines at Corby.

Raw materials for foundry use comprise Northamptonshire limestone and Lowick ganister, and there are also shown the iron ores from which the pig-iron is made, and various qualities of slag, which is broken and graded for roadmaking, filter beds, ballast, and farm and estate work. In addition there are cast-iron helical wheels, steel castings, steel sections and tube strip from the firm's foundries and steelworks.

The same company are exhibiting their tubular products on Stand No. 5, Row D.

PIG-IRON

(Stand No. 18 D.)

G. & R. Thomas, Limited, Hatherton Blast Furnaces, Bloxwich, Staffs, are exhibiting a recent model of their blast-furnace plant showing how the Staffordshire ironstone is calcined and then loaded on to the incline wagon for charging into the blast furnace. It is to be noted that their blast furnaces are about the last in this country to have open tops, and some old Staffordshire pipe ovens are also shown. The model of the winding engine is of interest, as this has been in operation for nearly 100 years. The firm also possess a twin-cylinder beam blowing engine which is used as a stand-by and which has been in operation for a similar number of years.

Castings made from their pig-irons are exhibited by various users.

Their allied firm, the Charcoal Iron Company, Limited, of Backbarrow, Lancashire, which own what is believed to be the oldest blast furnace in the world—it has been in more or less continuous operation since 1711—are exhibiting the original lintel which stood over the hearth, as well as a piece of the old charcoal "Lorn" pig-iron for which this furnace was long famous. Photographs of the furnace as it was in 1870 are also shown, together with some of the products of the old charcoal "refinery." In this refinery the charcoal pig-iron from the blast furnace was blown by means of a blast tuyere and charcoal in an open hearth until the iron was refined or purified by the removal of the other elements, and the plastic mass was then removed and hammered under a water-driven "tilt" hammer into ploughshares, hoes, etc. Some of the original products of this "refinery" are shown, as well as an old hearth. The whole plant is still driven by water power obtained from the River Leven, which drains Windermere Lake and passes through the company's property.

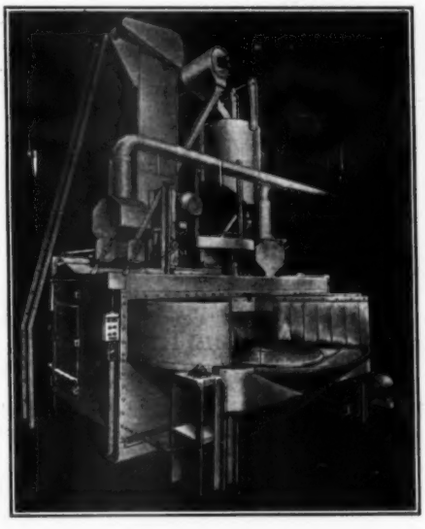
It is interesting to note that John Wilkinson, the father of the Staffordshire iron trade, worked with his father and his brothers when a boy in a small foundry opposite the furnace, and they used to carry the hot metal in ladles across the highway at tapping time and cast it into sad irons, etc. John Wilkinson afterwards became the proprietor of the furnace, and exhibited on the stand is a bronze token, dated 1787, found in the River Leven opposite the furnace three years ago, when the river was abnormally low.

The firm are exhibiting sample fractures of their "Leven" west-coast hematite malleable pig-iron in small pigs which is used largely by the malleable ironfounders of Great Britain. They are also showing examples of their "Valley" cold-blast pig-iron which is in general use by chilled-roll makers in this country as well as many firms abroad.

AIRLESS ABRASIVE CLEANERS

(Stand No. 14 E.)

The stand of *Tilghman's Patent Sand Blast Company, Limited*, of Broadheath, near Manchester, indicates that there have been many developments and improvements in sand and shot blast machines during the past year and also interesting developments in the "Wheelabrator," or airless abrasive cleaning foundry



"Tablast" Abrasive Cleaner, exhibited by Tilghman's Patent Sand Blast Company, Limited.

equipment. In addition to the "Wheelabrator Tumblast" machine shown, this firm is also exhibiting a most important development known as the "Tablast," which has been developed and perfected by the American Foundry Equipment Company, and of which Tilghman's have acquired the sole right of manufacture and sale throughout the British Empire (except Canada). The "Tablast," shown for the first time, requires no compressed air in its operation, is capable of dealing with all types of flat castings and eliminates any possibility of breakage. The machine shown has incorporated in the design one abrasive throwing wheel only, situated in a position to discharge vertically downwards. Machines of this type have been manufactured and successfully operated with one to four wheels, and in some instances the wheels have been placed in a horizontal position in order to ensure complete covering of intricate castings. One pass of castings beneath the wheel will effectively clean them, and two passes are sufficient to produce a surface perfect for vitreous enamelling. Sizes of main tables and of auxiliary tables can be made to suit the founder's requirements.

The "Wheelabrator Tumblast" on the stand incorporates several improvements on that shown at the previous Exhibition, two years ago, and has proved capable of producing four times the

work of pressure plant, whilst using approximately one-tenth the power. This type of machine is made in four sizes.

Working in conjunction with the above machines is shown one of the latest type dust arresting units, which are made in various sizes, and can be applied to overcome almost every dust problem. The firm's standard products are also well represented. In the sand and shot blast section there is shown a 3 ft. cabinet plant as representing a smaller size of a complete range of standard equipment of that type. Another interesting exhibit is the display of all kinds of metallic abrasives.

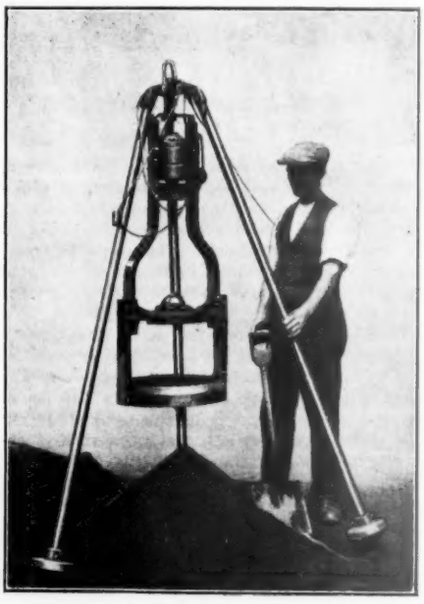
Air Compressors.—In this section the firm is showing a variety of its standard products, including the following:—(1) A double-acting, two-stage, intercooler type, having a capacity of 1,000 cub. ft. of free air per min., and suitable for pressures up to 120 lbs. per sq. in. (this is a typical example of a range of machines delivering from 400 to 3,000 cub. ft. of free air per min.); (2) a single-cylinder, low-pressure, double-acting machine, designed to deliver 120 cub. ft. free air per min. at a pressure of 60 lbs. (this is taken from a range of machines delivering from 100 to 800 cub. ft. free air per min.); (3) two compressors of the single-acting type having a capacity of 50 cub. ft. free air per min. respectively, these from a range delivering from 30 to 200 cub. ft. free air per min.; and (4) a single-acting compressor taken from a range delivering from 4 to 25 cub. ft. of free air per min., and being suitable for pressures up to 100 lbs. per sq. in.

It is not certain whether Mr. Tilghman will return to England in time for the Exhibition, but Mr. R. T. Ankers (who has recently returned from America), together with the London office manager, Mr. G. Hopkins, will be available on the stand.

FOUNDRY PLANT AND SUPPLIES

(STAND No. 14 D.)

Thos. W. Ward, Limited, of Albion Works, Sheffield, and elsewhere, are exhibiting a particularly wide range of raw materials for the foundry, such as the Priestman brands of foundry, Garesfield and Beehive coke; milled and raw Mansfield sand; hematite and foundry pig-irons; cupola ganister; limestone; wire brushes, and the like.



MECHANICAL SAND RIDDLE BY THOS. W. WARD, LIMITED.

On show for the first time is the "Forward" foundry sand riddle. Mounted on a tripod made of tubular steel carrying shoes, it is driven by a ¼-h.p. totally-enclosed electric motor, running at 1,400 r.p.m. through a ¾-in. steel shaft. This motor, because of the inclusion of a special coupling device, communicates a gyratory and vibratory motion. The riddle is fitted throughout with ball bearings, adequately protected from dust. The 22-in. sieve is easily removable and replaceable. The machine weighs about 200 lbs. and is thus reasonably transportable. The tripod is also detachable and the apparatus can be suspended from a railway truck or joist.

FOUNDRY FURNISHINGS

(STAND No. 15 A.)

Thomas Wilkinson & Company, Limited, of Stockton Street, Middlesbrough, have several new developments since the previous exhibition. Apart from the displays of their many lines of foundry furnishings and requisites, from the various types of tinned chaplets, pipe nails, etc., to bellows, coke baskets and spades, there are displayed numerous samples of their well-known grades of foundry blackings, of which the "Carlton" patent blacking is perhaps the best known.

In addition to these exhibits the centre portion of the stand is occupied by a machine for the manufacture of straw rope, and demonstrations of its working are being given frequently throughout the exhibition. It is of interest to note that this is an entirely new departure for the firm, and it is expected that it will soon leave the experimental stage and will become one of the firm's regular products, as the quality of the English straw is recognised as being superior to imported material for foundry use.

PIG-IRON

(STAND No. 17 E.)

The display of the *Workington Iron & Steel Company* (branch of the United Steel Companies, Limited) is on somewhat different lines from those at previous exhibitions. A small cinema, complete with ample and comfortable seating, has been built on the stand, and films are being shown of the manufacture of machine-cast pig-iron at the Workington Company's works, and the mining of hematite ore at the Beckermet (Cumberland) mines. The films are of a very detailed character, and may be said to be "pictorial visits" to the works and mines.

The actual materials shown on the stand include samples of machine-cast hematite iron and U.C.O. iron. Some applications of this latter quality are also displayed. Another section of the stand is given over to a display showing the raw materials used in the production of pig-irons.

Catalogue Received

Dismantling. In connection with their dismantling business, George Cohen, Sons & Company, Limited, of 600, Commercial Road, London, E.14, and elsewhere, has issued a well-produced brochure which recaptures some of the romance of bygone engineering achievements by illustrating the ruins of some one-time famous plants and engines. We were particularly appreciative of the horizontal panel surmounting the first page of letterpress. It is presumed that the issue of this brochure will serve as a reminder that many industrial establishments may possess some obsolete plant, which sentiment alone causes to be retained, and that the time has arrived for its removal whilst scrap is scarce.

A SUBSIDIARY COMPANY of Midgley & Son, Limited, Spartan Works, Carlisle Street, Sheffield, to be called Yorkshire Aluminium, Limited, is to make aluminium at the works in Sheffield.

Research in Engineering

Before Section G—Engineering, of the British Association at Nottingham on September 2, Sir Alexander Gibb, G.B.E., C.B., F.R.S. (President of the Section), gave an address on "Research in Engineering," in which at the outset he reviewed briefly the growth of research in this country and also in Germany. Continuing, the speaker pointed out that the National Physical Laboratory was founded just prior to 1902; and two years later, the British Engineering Standards Association was established, by the co-operation of the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institute of Naval Architects, and the Iron and Steel Institute, under the chairmanship of Sir John Wolfe Barry, the great civil engineer. Since 1900 research has been, on the whole, recognised as a question of national importance.

The history of the National Physical Laboratory (continued the speaker) has been one of continual expansion. From Kew it removed to Teddington to have greater space. In 1901 the Engineering Laboratory was completed. In quick succession followed departments dealing with electrotechnics, electrical standards, optics, thermometry, pyrometry, tide-predicting, road materials, physics, metallurgy, aeronautics, ship-model testing, to mention only a few of its manifold activities. The original committee of eight, under the chairmanship of Sir John Wolfe Barry, that controlled the British Engineering Standards Association, has now expanded into a body of 870 committees with 4,850 members.

Research and Finance

Turning to the all-important question of finance, the speaker recalled that research was expensive. In the early days of discovery it was inevitably at the expense of the individual, and in this way many private fortunes were spent for the ultimate good of industry and humanity. In the nineteenth century, apart from the scientists who spent their private fortunes, research was largely dependent on the endowment of public-spirited benefactors, and to scientific societies. Government more far-seeing than the general public and in spite of futile criticism, began to aid in a small way from the middle of the century onwards. Generally speaking industry had not realised the importance of research and its attitude was almost hostile until the twentieth century was well on its way. But it was now sufficiently admitted that research should be paid for by those who benefit by it—the community and industry. The attitude of industry had changed from indifference to support. The steady increase in the total sum which industry as a whole provided annually for the development of Research Associations gave one good reason for taking an optimistic point of view. In the year 1932-33 a total sum of £167,370 was supplied by all the industries concerned for the support of the Research Associations organised by them. In 1935-36 the figure had grown to £232,468; an increase of 40 per cent. in three years. But even so the position was not yet satisfactory, said the speaker, and industry still lagged behind in its support of these Associations, in spite of the liberal encouragement of Government. He had no doubt, however, that this state of affairs would not last. The greater the success of research, the more immediate and drastic the effect on existing plant and equipment. That was where the rub sometimes lay. Millions were necessarily sunk in fixed assets, which might in a year or two be made obsolete by the development of new methods. Obsolescence was indeed so rapid nowadays, that it was not unusual for new plant to be written off in four years; and many valuable inventions had been bought up by vested interests and suppressed in order to save the greater loss that their exploitation would involve to already operating plant.

THE ENGINEERING AND MARINE EXHIBITION

It should be clearly understood that all the foundry exhibits at Olympia are not confined to the section carrying that designation, and a considerable proportion of the displays outlined below are just as interesting as those concentrated in the actual foundry exhibition. In plant, there are air compressors, testing machines, electric furnaces, and many varieties of tools, such as gagger benders, grinders and files for the fettling shop. Amongst raw materials, there are core oils, fillers for blow holes, and the usual sundries for the stores. There are also co-operative research exhibits, and one organised by the gas industry.

MEASURING INSTRUMENTS

(STAND No. 12 K, GALLERY.)

The Accurate Recording Instrument Company, Aric Works, Manor Road, Teddington, exhibit a range of "Liquidometer" tank-contents gauges. This range includes many direct-reading models for fitting upon tanks, and some models are so arranged that, with the exception of the operating float, no part of the mechanism comes in contact with the contents of the tank, which may, if necessary, be under pressure or vacuum.

An entirely new type of distance-reading thermometer is shown. This instrument has a unique and individual compensation for capillary and head temperature variations over a wide range, and is particularly applicable for the measurement of free air temperatures.

SPRAY GUNS

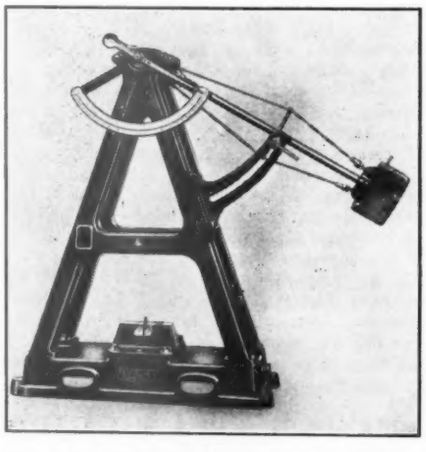
(STAND No. 14 D, GALLERY.)

Aerostyle, Limited, 174/176, St. John Street, London, E.C.1, are showing a complete range of plants starting from portable electric or petrol-engine driven compressors to the actual gun. Special models suitable for blacking moulds have been developed.

TESTING MACHINES

(STAND No. 2 H.)

Machines for carrying out all the usual physical tests on metallic specimens are shown on the stand of *W. & T. Avery, Limited*, Soho Foundry, Birmingham. Prominent amongst the exhibits



IZOD IMPACT TESTING MACHINE, BY W. & T. AVERY, LIMITED.

is a self-indicating universal testing machine of 50 tons capacity, for carrying out standard tests in tension, compression, bending, shearing and hardness. The load is indicated on a graduated dial in clear view of the one operator required. The machine is particularly suitable for quick commercial requirements, but as the speed is readily controllable, the rate of straining can be extremely slow if desired.

Two hardness testing machines are shown. One, a self-indicating machine, has been designed for rapidly determining the Rockwell hardness of materials in terms of standard penetration. A direct numeral reading is given on the dial, necessitating no subsequent measurement or calculation. The method of testing is such that all errors due to surface imperfections of the specimen are eliminated, and the whole operation can be carried out in approximately ten seconds. The machine is, therefore, mainly suitable for production testing, and since the mark left by the penetrator is so slight, many finished articles can be tested without damage.

The second machine is designed to carry out the standard Brinell hardness test. It is constructed to the high degree of accuracy and with the finish of a scientific weighing machine. Being calibrated by means of dead weights, an accuracy of one-thirtieth of 1 per cent. can be guaranteed. Special features of the machine are that the load is gradually applied through a worm drive and that it can be maintained for any prescribed time period.

The determination of fatigue stress in metals is catered for by a fatigue testing machine, which is designed for applying alternating bending stresses upon metals. It is arranged to test the cantilever form of specimen by single point loading as originated by Wohler.

The shock stress resistance of materials is determined by the Avery 626 Izod impact testing machine. An improved model is exhibited, in which the quadrant is inverted to facilitate readings, and other important refinements have been effected.

A new addition to the range is a wear and lubricant tester, by means of which the relative wear of metals can be ascertained from the dimension of an impression made by the periphery of a rotating wheel of one metal coming into frictional contact with a stationary flat sample of another metal. The principle is much the same as where the impression of a ball or diamond cone is taken as a measurement of hardness.

PACKINGS, HOSES AND JOINTINGS

(STAND No. 6 B.)

The "Pilot" brand of packings and jointings of all descriptions is shown on the stand of the *Beldam Packing & Rubber Company, Limited*, of 16, Gracechurch Street, London, E.C.3. Hose for compressed-air lines is a speciality of this firm.

ELECTRIC FURNACES

(STAND No. 8 A.)

The stand of *Birmingham Electric Furnaces, Limited*, Birlec Works, Tyburn Road, Erdington, Birmingham, concentrates attention on tool room and melting furnaces, in which classes several noteworthy developments are shown. In addition, a very extensive display of photographs, literature and sample products effectively represents the extremely wide range of their furnaces, for every heat-treatment and melting application, the size of which precludes installation on the stand. The unique "Certain Curtain" controlled atmosphere furnaces for hardening high-speed and alloy steel tools are exhibited in the latest improved and simplified form. New constructional methods give improved appearance and convenience in use while revised design has made the atmosphere control system both simpler and more accurately adjusted.

"Birlec" high-velocity air-circulation furnaces, as widely used for tempering and other

"BIRLEC DETROIT" INDIRECT ARC ROCKING FURNACE, BY BIRMINGHAM ELECTRIC FURNACES, LIMITED.

low-temperature heat-treatment operations, are represented by a model of convenient size for tool room use. The well-known charge "progress recorder," which enables heating and soaking times to be measured accurately, is shown with this exhibit.

Of great interest to the foundry industry is the new "Birlec Detroit" furnace which is being shown. This type of indirect arc rocking furnace has won widespread recognition of its exceptional qualities in both ferrous and non-ferrous melting, and the new model incorporates several important developments, including a new design of shell and the patented automatic rocking control device. The latter gives exceptional flexibility and range of control, permitting the most satisfactory metallurgical conditions to be obtained and repeated exactly for every type of charge.

Technical representatives are on the stand to discuss and demonstrate the foregoing and all other types of Birlec furnaces for heat-treatment and melting, including such equipments as the bright annealing and brazing furnaces which the firm have pioneered in this country.

NON-FERROUS ALLOYS

(STAND No. 12 E, GALLERY.)

Barronia Metals, Limited, Power Road, Gunnersbury, London, W.4, have specialised in the production of non-ferrous alloys for the engineering industries for the past 15 years. A great

deal of technical data and experience of practical value has thus been accumulated, and this, together with the company's extensive laboratories, is freely available to clients. Several interesting examples of this side of the company's activities are shown.

REFUELLING VALVE, MADE OF BARRONIA METAL, FOR THE EMPIRE FLYING BOAT, "CALEDONIA."

ALUMINIUM

(STAND NO. 19 C, GALLERY.)

Aluminium and its light alloys, in ingot and semi-manufactured forms, as produced by the *British Aluminium Company, Limited*, Adelaide House, London, E.C.4, are to be seen in great variety. Upon a turntable, surmounted by an aluminium sphere—itself an example of clever spinning—are aluminium ingots, notched bars, sheets, strip in coil, circles, tubes, bars and rods, together with a selection of the drawn and extruded sections for which the company has over 3,500 tools. Complicated hollow sections in pure aluminium are to be seen, in addition to sections of B.A. Co. standard alloys coated with pure aluminium.

Anodised and coloured aluminium tubes form the central feature of the turntable, and a separate display is made of aluminium work carrying this very popular protective finish. Other aluminium exhibits include free-cutting aluminium alloy BA/35, which gives clean surfaces and screw threads without clogging on fully-automatic machines; pistons of various sizes, including a large marine piston; binnacle, windscoops, and other marine fittings; high-strength aluminium-alloy forgings; sundry pressure and gravity die-castings; textile reels and bobbins, and aluminium foil for heat and sound insulation.

An exhibit of special interest is a complete motor-cycle of somewhat advanced design, which serves to emphasise the possibilities of aluminium alloys not only for the engine castings for which they are standard practice, but also (using, of course, alloy of high-tensile strength) for framework of motor-cycles. In the present instance, the complete framework is in Duralumin and the fork links and various other parts are in aluminium-bronze. Aluminium in major details of the stand—for example, showcase framing, fascia decoration and lettering (the latter in the company's virgin aluminium notched bars, bent cold), mouldings and platform edging—together with the framing of works photographs on an adjoining partition, complete a very representative display of the possibilities of the metal.

GAS IN INDUSTRY

(STAND NO. 2 K.)

The *British Gas Federation*, 1, Grosvenor Place, London, S.W.1, representing as it does not only gas undertakings but also manufacturers of gas-making and burning equipment, has the whole gas industry behind it, and shows some striking examples of the use of gas in industry.

In the working heat-treatment shop visitors can have their own specimens heat-treated while they wait. The equipment consists of an Incandescent Heat Company's 3 ft. by 2 ft. by 1 ft. "Super" natural-draft oven furnace of the type now so popular in aeroplane and motor-car works for hardening, carburising, reheating, etc.

A natural-draft salt bath furnace is interesting for several reasons. The pot itself is an exceptionally large hot pressing; and this process can only be applied where large quantities are required. The sale of these gas-fired pot furnaces has been so large that the bold step of producing these special pots in this way has been amply justified—to the great advantage of the user who has to pay far less for his pots than formerly.

A recirculated atmosphere furnace as used in aeroplane and motor-car works for heat-treating many of the new light alloys which have to be treated very accurately to give them the required characteristics, is another interesting exhibit.

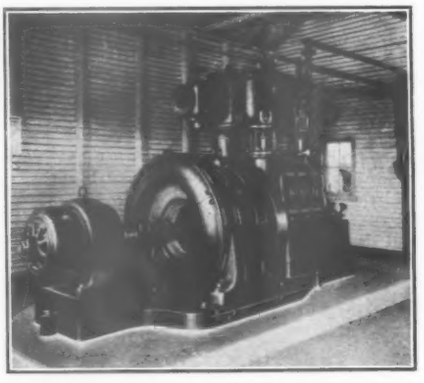
For high-temperature metal melting (brasses, etc.) a conventional tilting crucible gas furnace made by the Morgan Crucible Company is shown.

A notable feature of the exhibits is the amount of automatic control gear fitted. Almost all the best-known makers of control gear are represented and many of the exhibits are controlling the furnaces which are working. Blowers for the supply of air for air-blast burners have been provided by Keith Blackman, Limited, who are also responsible for the compressors supplying gas and air to the glass-blowing burners.

AIR COMPRESSORS

(STAND NO. 4 C.)

J. Browett Lindley (1931), *Limited*, Letchworth, Herts, are showing typical examples of their range of compressors. They have a 750 cub. ft. per min. two-stage double-acting motor-driven



750-CUB. FT. PER MIN. TWO-STAGE DOUBLE-ACTING MOTOR-DRIVEN AIR COMPRESSOR, BY J. BROWETT LINDLEY (1931), LIMITED.

unit, which is arranged to rotate slowly so that the working parts can be seen in operation through glass doors. This machine, which is of standard type, delivers the air at a pressure of 100 to 120 lbs. per sq. in., for which 145 h.p. is required at the shaft coupling at 428 r.p.m. The cylinder diameters are 17½ in. and 11 in., and the stroke is 8½ in. The cylinders are of cast iron with exceptionally large water-jackets mounted on distance pieces, which separate them from the crankcase and which also form the crosshead slides. By this arrangement the cylinder lubrication can be controlled independently of the motion work, so that the greatest economy of oil is secured and the outlet air or gas is practically free from contamination.

The valves are of the ring-plate Hoerbiger type, so arranged that the clearance space is reduced to a minimum. The lift is extremely small, and as there are no wearing parts no lubrication is required and the valves give an extremely long life with the minimum of attention. The entire motion work is enclosed in a frame which has large doors for easy access. Forced lubrication is provided to every working part, the pump for this purpose being situated in the baseplate. The latter, incidentally, is unusually wide, so as to give great rigidity, steady running and an ample cooling surface for the crankcase oil.

A 200 cub. ft. per min. "Monobloc" type compressor is being shown for the first time.

SURFACE TREATMENT

(STAND NO. 3 G.)

The Calorizing Corporation of Great Britain, Limited, 32, Farringdon Street, London, E.C.4, are exhibiting heat-treatment containers for case-hardening, cyanide-salt and lead hardening and annealing, superheater supports, pyrometer sheaths, baking cradles, furnace-component parts, etc., in calorised mild steel and Calmet heat-resisting alloy steel, together with photographs of other manufactures and applications, including spiral conveyors, agitators, oil-cracking tubes, supports, recuperators and air heaters.

ALUMINIUM CASTINGS

(STAND NO. 17 B, GALLERY.)

At the stand of *Robert W. Coan, Limited*, Coan House, Duncan Street, Islington, London, N.1, our readers can enjoy a "busman's holiday," for on it are hundreds of both sand and die castings in light alloys.

PNEUMATIC TOOLS

(STAND NO. 10 J.)

The Consolidated Pneumatic Tool Company, Limited, Egyptian House, 170, Piccadilly, London, W.1, show a new type of vibrator specially designed for vibrating moulds. They also exhibit a complete range of pneumatic tools, including their well-known portable Boyer pneumatic hammers for riveting, fettling castings, and cleaning off old paint preparatory to repainting; pneumatic rammers for foundry work; new designs of "Power Vane" and "Little Giant" drills, grinders, sanders and polishers.

A two-stage air-cooled portable compressor and a stationary-type compressor are shown, together with a complete series of "Hicycle" high-frequency electric tools and "Little Giant" universal electric tools for drilling, reaming, screw-driving, nut and stud running, grinding, sanding and polishing—indeed, for every operation requiring a rotary motion.

GREY-IRON AND LIGHT-ALLOY CASTINGS

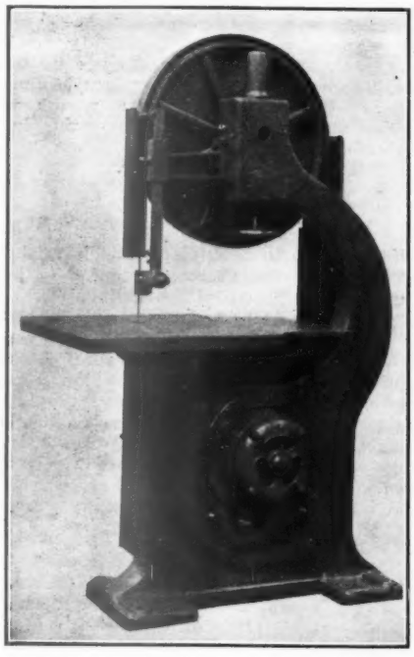
(STAND NO. 15 H.)

W. H. Dorman & Company, Limited, Foregate Street, Stafford, possess well-equipped foundries where they not only produce the various castings required in the manufacture of their extensive range of engines, but also a considerable tonnage for clients throughout the motor, electrical and general engineering trades. A part of the display consists of products of the foundry department, which are typical of such castings. Of special interest to foundrymen is a display of die-casting machines.

PATTERNMAKING MACHINERY

(Stand No. 10 C, Gallery.)

The Dominion Machinery Company, Limited, Hipperholme, Halifax, include amongst their woodworking machinery a number of models



30-in. Motor-driven Band-Saw, by the Dominion Machinery Company, Limited.

specially designed for pattern-shop use. Special attention is called to a 16-in. belt-driven saw bench, having a rise and fall table, guards and fence, and to a 30-in. motor band-saw.

SCIENTIFIC AND INDUSTRIAL RESEARCH

(Stand No. 17 A, Gallery.)

The Department of Scientific and Industrial Research is responsible for a large stand on which the exhibits illustrate researches carried out under the Department on engineering and metallurgy, the design of ships' hulls and propellors, on coal, on the transport and storage of food and on the fire resistance of structures. In addition exhibits are provided by the British Non-Ferrous Metals Research Association, the British Cast Iron Research Association, the British Scientific Instruments Research Association and the Industrial Research Council of the Iron and Steel Federation.

A striking feature is the extensive use of cinema films. Short films on the stand show how some of the researches, the results of which are displayed, were actually carried out, while in a separate hall programmes of sound films are being shown at frequent intervals. Among these latter is a film showing the work at the National Physical Laboratory on the production of new light weight alloys. There are also films dealing with woodworking machinery. Another remarkable film, made at the National Physical Laboratory, shows how air in a wind tunnel can be made visible. In this film the heated air streaming from a person's hands or from his nostrils, or from a hot wire, can be seen, and the method for making this possible is applied for showing what happens when a body is streamlined or an aeroplane stalls. On the stand itself short silent films illustrate how the Non-Ferrous Metals Research Association carries out research on the founding of metals.

The Engineering Department of the National Physical Laboratory is showing machines for testing components such as crank shafts, exposed to simultaneous cycles of bending and torsion. It is also exhibiting one of the latest machines used for research on the lubrication of bearings and for tests on lubricants and bearing metals. Some of the latest apparatus and results in researches on the use of metals at high temperatures are also shown.

The Iron and Steel Industrial Research Council illustrate by a model researches carried out on the performance of a "hot blast stove" which is really an air-preheater to a blast furnace. The steel industry has hitherto lacked reliable information concerning the performance of such plant. The British Cast Iron Research Association shows a model of the Balanced-Blast cupola, a type of melting furnace which not only yields an improved quality of metal, but also enables considerable economies in working to be made. Over 160 of these cupolas have been installed, and it is estimated that when the industry is completely equipped with them, a saving of over £200,000 a year in fuel cost will be achieved. Other exhibits of the British Cast Iron Research Association deal with the latest work on shrinkage in castings, the formation of graphite and enamelled cast iron.

CRACK DETECTION

(Stand No. 11 A.)

The stand of the *Equipment & Engineering Company, Limited*, of 2 and 3, Norfolk Street, Strand, London, W.C.2, usually attracts interested groups of visitors, as by means of the "Magnaflux" crack detector defects not visible to the naked eye are clearly revealed. An example of a rough-surfaced piston casting is a typical foundry exhibit.

SPRAYING EQUIPMENT

(Stand No. 17 C, Gallery.)

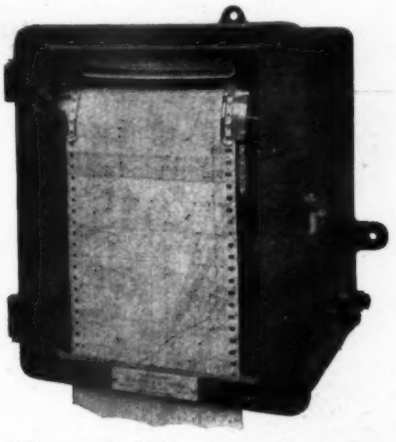
Kurt Erlach, Limited, of Volspray Works, Cray Road, Sidcup, Kent, are exhibiting their well-known range of "Volspray" painting equipment. The most important exhibit is the 1A/2 portable spraying outfit. This equipment operates the standard full-size pistol supplied and works off any ordinary electric-light point, A.C. or D.C., within the voltage range. A comprehensive range of portable electric and petrol-operated outfits, as well as single- and multi-gun plants for installation in the workshop, are on view.

PYROMETERS

(Stand No. 2 K.)

Ether, Limited, of Tyburn Road, Erdington, Birmingham, are showing a full range of pyrometers for recording, indicating and controlling temperatures. The most interesting exhibit from the foundryman's point of view is the well-known Ether molten-metal pyrometer, which is being widely used throughout the world for the measurement of molten ferrous and non-ferrous metal temperatures. The instrument has many exclusive features, such as the telescopic couple-holder which ensures economy in thermo-couple upkeep, and the patent concentric moving system ensures robustness and great accuracy. The use of this instrument to control the melting temperatures forms an indispensable item in the foundryman's equipment. The metals covered by the temperature range of the instrument are as low as lead and tin type-metal and extend to aluminium, brass, gunmetal, phosphor-bronze and cast iron where the castings are of large section.

The "Indicorder" continuous chart recorder (which we illustrate) is particularly suitable for use in vitreous enamelling, as it gives a continuous record of the temperature of the muffle for one month without attention. The Ether Edgewise indicator is largely used for the measurement of salt-bath and muffle temperatures as used for the heat-treatment of aluminium alloy castings. Other instruments shown



"Indicorder" Continuous Chart Recorder, by Ether, Limited.

are suitable for the automatic control and measurement of core-stove and furnace temperatures, whether gas, coal, coke or oil fired.

CHAIN BLOCKS AND LIFTING TACKLE

(Stand No. 9 J.)

Felco Hoists, Limited, 17, Victoria Street, Westminster, London, S.W.1, are exhibiting triple-gear chain blocks; "Ropelock" hoists; sling chains and pulling jacks. All of these are used in foundries and will appeal to the industry in general.

STAINLESS STEEL

(Stand No. 6 H.)

The outstanding merit of "Staybrite" steel manufactured by *Firth-Vickers Stainless Steels, Limited*, Staybrite Works, Sheffield, 9, is its complete resistance to sea water and other corroding influences, and its particular application for mechanical as well as decorative purposes is exemplified by a wide range of marine and general ships' fittings. These cover not only "Staybrite" steel gear and deck fittings, including flexible "Staybrite" steel wire, thimbles, rigging, screw locking bars, nuts, bolts and split pins, but also port holes, fair leads, yacht anchors, and a wide selection of other cabin and deck fitments.

The form in which the steel is supplied—in castings, sheet, bar, forgings, wire, wire mesh, bolts, etc.—is also in evidence, and a series of interesting photographs enables visitors to envisage its application, not only on the large ocean liner, such as R.M.S. "Queen Mary," but also in its special application for yachts, as used on the "Endeavour" and other well-known racing craft.

The stand is staffed with a number of technical experts, who will be pleased to advise on any special adaptation of this super rustless steel.

BENCH TOOLS

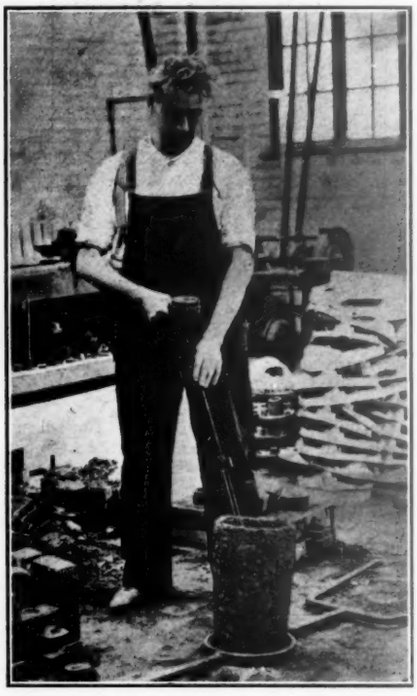
(Stand No. 28 F, Gallery.)

Fry's (London), Limited, 24/25, King Street, London, E.1, are showing "Enox" tool grinders and "Enox" electric grinder No. 8. The latter is normally mounted on a pedestal, but can be a bench machine. It is driven by a half horse power motor, takes a 6 in. by $\frac{1}{2}$ in. wheel and operates at 2,800 r.p.m. The electric grinders are double-headed bench machines taking wheels up to 10 in. by $1\frac{1}{2}$ in. They are available in several sizes.

PYROMETERS

(STAND No. 5 H.)

Foster Instrument Company, Limited, Letchworth, Herts, are demonstrating a complete range of indicating, recording and automatic controlling pyrometers for heat-treatment purposes. In addition they are showing one or two



SMALL PYROMETER OUTFIT FOR NON-FERROUS METALS, BY THE FOSTER INSTRUMENT COMPANY, LIMITED.

specialised models of particular interest, including self-contained miniature pyrometers for molten non-ferrous metals, full-size pyrometer outfits for non-ferrous metals, and optical pyrometers for use on molten cast iron and steel.

PORTABLE TOOLS

(STAND No. 7 B.)

F. Gilman (B.S.T.), Limited, 195, High Street, Smethwick, exhibit a full range of their "Skatoskalo" machines for tube and surface scaling work. These machines, together with the flexible drives and various patterns of handpieces, are suitable for straight or bent tubes, and for dealing with tubes made of mild steel, brass, copper and other material. In addition, a full range of "Multi-Flex" machines is exhibited. Such machines are being shown on floor stands, bench stands, suspended sets, and also portable machines with handle carrier. This range of machines incorporates one, two, three, four and eight speed equipments for grinding, drilling, wire-brushing, sanding, polishing, rotary filing and milling and other similar purposes.

As many as possible of the machines are being shown actually running, and demonstrations are given on the stand.

ELECTRIC TOOLS

(STAND No. 18 K.)

Grimston Electric Tools, Limited, 138, Lever Street, London, E.C.1, have a number of small power-driven tools of particular interest to foundrymen. There is a range of double-headed grinders, and many flexible-shaft driven tools such as sanders, aluminium files, drills and wire brushes.

DRAWING-OFFICE SUPPLIES

(STAND No. 10 H.)

J. Halden & Company, Limited, 8, Albert Square, Manchester, 2, show many examples of electric photo-copying machines, drafting tables, drawing instruments and various sundries for the drawing office. As foundry managers' offices now look like a corner of the drawing office, such exhibits are of undoubted interest to them.

LIGHT-ALLOY CASTINGS

(STAND No. 4 C, GALLERY.)

High Duty Alloys, Limited, 81, Buckingham Avenue, Trading Estate, Slough, show typical examples of the "Hiduminium" R.R. series of high-tensile aluminium alloys, in all cast and wrought forms. Diesel engine pistons are shown in sand-cast "Hiduminium" R.R.53, and in "Hiduminium" R.R.59, which is a wrought alloy. Cylinder-head and crankcase castings in "Hiduminium" R.R.50 for Diesel engines are included in the exhibit. Of particular interest is the application of "Hiduminium" R.R.56 for wrought big-end bearings.

Examples of extruded sections and tubes in anodically-treated and anodically-coloured conditions are being shown, together with typical micro and macro sections of "Hiduminium" alloys.

STEEL CASTINGS

(STAND No. 4 C.)

Kryn & Lahy (1928), *Limited*, Letchworth, Herts, show a number of types of castings covering a wide variety of industries, the chief of which are ships' davits, pressure castings (including steam chests), railway locomotive castings, excavator castings, also traction motor frames and other components of electrical machinery. Examples of the use of K.L. "Stronger Steel," one of the firm's main productions, occupy an important part in the steel castings exhibit. This material combines the strength of high-tensile steel with the ductility normally associated with mild steel, and is finding an increasing number of applications. The makers guarantee a tensile strength of 35 to 40 tons per sq. in., an elongation of at least 20 per cent. on the standard B.S.S. test-piece, and a cold-bend test to an angle of at least 120 deg. on the standard B.S.S. test-piece.

FLEXIBLE SHAFT-DRIVEN TOOLS

(STAND No. 16 K.)

Lorant & Company, Limited, 98, Croydon Road, London, S.E.20, show flexible-shaft outfits which are already used by many foundries. They give speeds of 1,600 r.p.m. and 10,000 r.p.m. Numerous experiments have been carried out and proved conclusively that rotary files, on hard metals like steel and cast iron, will stand up best at a low speed of 850 r.p.m., while on soft metals like aluminium they should be worked at 3,500 r.p.m. for the largest sizes and at 1,100 r.p.m. with the small size of cutters, to obtain best results. There is apparently a certain justified objection to the use of universal motors, as the speed is not constant and one has to exercise great care in their use.

An entirely new "Lor-3" outfit is being shown consisting of a ¼ h.p. oversize three-phase motor giving 3,000 r.p.m. on one side and 850 and 10,000 r.p.m. on the other. The motor has a built-on starting switch and length of rubber-covered cable, fitted with a flexible shaft of about 4 ft. 6 in. length and double ball-bearing collet chuck to take tools with a 6 mm. shank. The outfit will take grinding wheels of 3 in. dia. to run at 10,000 r.p.m.

This firm is also showing "Prelu" patented air grinders in three sizes, giving speeds from 25,000 to 70,000 r.p.m. These are particularly suitable for cleaning up intricate castings, and for polishing patterns.

CASTINGS RECLAMATION

(STAND No. 1 B.)

Major, Robinson & Company, Limited, 385 and 387, City Road, Cornbrook, Manchester, 15, have a new model of a core iron and gagger bending machine. It takes bars up to ½ in. diameter or, using the centre pin alone, ¾ in. If there be no competitors around, foundrymen may display interest in "Scols" metallic cements for filling up small cavities in iron, steel and non-ferrous castings without leaving a trace of their existence! The repairs will machine up like the rest of the casting in a number of cases.

FIRE HAZARDS

(STAND No. 23 B, GALLERY.)

Minimax, Limited, Feltham, Middlesex, have been appointed official contractors for the supply of the necessary chemical fire extinguishers for the protection of all stands, to comply with the London County Council regulations. They are exhibiting numerous types of chemical fire extinguishers in varying liquid capacities for all types of fire risks, also fire hose, couplings, branch pipes, etc., first-aid hose reels and other fire-fighting equipment. First-aid boxes, an item in which this firm specialises, are also being shown.

USES OF NICKEL

(STAND No. 2 G.)

The stand of the *Mond Nickel Company, Limited*, Thames House, Millbank, London, S.W.1, seeks to explain many of the advantages and applications of nickel alloys by means of a series of animated models, dioramas and stereoscopic pictures. For example, one diorama illustrates mining equipment, including the use of nickel steel in mine cages. The exhibit emphasises that strength is not sacrificed because the structure is relatively light; greater loads can be carried each journey or a lighter cable used for the same load. The prototypes of the cutters and loaders in the model employ nickel alloy steels to withstand the heavy stresses and abrasion met with in service, and "Ni-Tensyl," a high-strength nickel cast iron, is used for large winding drums similar to the one in this display.

A model machine shop effectively demonstrates the use of nickel cast iron and nickel alloy steels in machine-tool equipment.

The nickel-aluminium magnet steels are represented by an ingenious model of an aeroplane floating in the field of force above a nickel-aluminium steel magnet, and several other magnetic models designed to illustrate the power of nickel-aluminium steel magnets afford interesting exhibits.

A stereoscopic picture provides a striking comparison between the loads which may be carried by "Ni-Tensyl" and by ordinary cast iron. The two models illustrated typify the ease with which a casting of thick and thin sections may be made in "Ni-Tensyl" and the unsoundness and chill which may result when a similar casting is made in ordinary cast iron.

Another model illustrates the superior wear resistance of nickel-cast-iron cylinder liners when used in commercial and other vehicles which make short journeys with frequent stops.

A stereoscopic picture of two connecting rods, one of carbon steel and one of nickel alloy steel, affords another interesting comparison. Other stereoscopic displays include a picture which illustrates the interesting fact that nickel cast iron has a certain degree of malleability, and a colour stereoscopic picture of the internal sections of used brass and nickel copper condenser tubes.

The fittings of the stand itself indicate one or two architectural uses of nickel silver.

VALVE CASTINGS

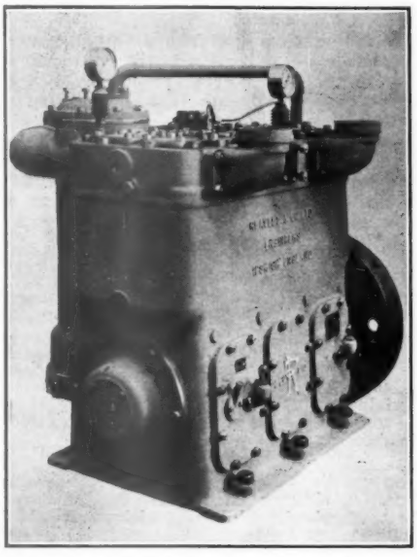
(STAND No. 19 D, GALLERY.)

Newman, Hender & Company, Limited, of Woodchester, Glos, exhibit a comprehensive range of Newman-Milliken patent glandless lubricated plug valves for handling petroleum derivatives, acids, gases, water, air, steam, foodstuffs, etc. The valves are shown manufactured in various materials, including cast iron, semi-steel, "Ni-Resist," gunmetal, acid-resisting bronze, aluminium, steel, "Aterite" and stainless steel, suitable for services from vacuum to 3,000 lbs. per sq. in. Owing to the construction of the valves, there are no glands or packing, and the parallel plug, which is the only moving part of the valve, floats in lubricant, and cannot therefore rust or stick, and being always in perfect contact with its seating, eliminates any chance of foreign matter getting between the plug and body of valve.

AIR COMPRESSORS

(STAND No. 5 C.)

Reavell & Company, Limited, of Ipswich, show a very complete collection of their standard products, including two double-acting two-stage intercooled compressors for 100 lbs. pressure, one



NEW TYPE OF TWO-STAGE VERTICAL AIR COMPRESSOR, BY REAVELL & COMPANY, LIMITED.

of which is to deliver 1,000 cub. ft. of air per minute at 360 r.p.m., and the other 500 cub. ft. at 480 r.p.m. The Quadruplex compressor, which the company first introduced 38 years ago, is represented by one of the modern types with roller bearings throughout, the machine being of 400 cub. ft. capacity at 580 r.p.m.

Two of the standard single-acting high-speed compressors are shown, and two of the single-acting two-stage type; also one of their well-known rolling-drum rotary compressors, and one of their smallest sizes without the rolling drum.

As it was not possible to show the various sizes of the standard single-acting single-stage and two-stage machines, or of their rotary compressors, the firm have adopted the novel expedient of exhibiting enlarged photographs of these machines in all their standard sizes in independent groups, and these serve excellently to illustrate the great range of sizes in which these reciprocating and rotary compressors are made.

CONVEYORS

(STAND No. 8 H.)

The main exhibits of the *Renold and Coventry Chain Company, Limited*, Renold Works, Didsbury, Manchester, is a working-model bulk material conveyor. This model is shown handling bulk material in various ways, so as to form a continuous conveying system. The whole unit is driven by means of a ¼ h.p. motor, connected to a Renold chain speed transformer by means of a chain coupling, with external chain drives to the various types of conveyors. The material handled passes from an upper feed hopper on to a scraper conveyor, which carries it to the boot of a bucket elevator. This elevator picks up the material from the boot and discharges it into a second feed hopper, which is fitted with a mechanically driven rotary feed device at its lower end. From the rotary feed, the material passes into the buckets of a gravity bucket conveyor which carries it back to the level of the upper feed hopper, into which it is returned by the action of a bucket tipper. Since any material passed into this hopper is automatically fed back to the scraper conveyor, the material is passed round the system continuously.

A wide range of chains suitable for every type of power transmission and conveying and elevating, is also being exhibited, including those specially designed for diesel engine camshaft and auxiliary drives. The chains manufactured vary from 8 mm. to 8 in. pitch, and from 800 lbs. to 1,000,000 lbs. breaking load. In addition, other products manufactured by the company are displayed. These include stock chain wheels, for both roller and inverted tooth chains, chain clutches, Renold chain couplings, Renold-Hardy flexible couplings, and a Renold chain speed transformer.

INDUSTRIAL SAFETY EQUIPMENT

(STAND No. 8 C.)

Siebe, Gorman & Company, Limited, 187, Westminster Bridge Road, London, S.E.1, show asbestos suits, acid-resisting suits, safety goggles, dust masks, protective gloves, welders' helmets and hand-shields, and other industrial safety and protective appliances.

CORE OILS

(STAND No. 1 C, GALLERY.)

The firm of *Sternol, Limited*, of Royal London House, Finsbury Square, London, E.C.2, has for more than 50 years played an important part in the development of materials used in the processing of primary products. The "Sternocore" range of core oils and binders has been considerably developed under the supervision of Dr. J. G. A. Skerl, late of the British Cast Iron Research Association, and these are featured on the stand, together with a selection of the company's process and lubricating oils and materials of interest to the visitors.

The "Sternocore" products have been developed from the best materials in order that they should be of the highest possible efficiency. It is claimed that this efficiency is exemplified in the use of less "Sternocore" material than with comparative grades, resulting in lower core-making costs, quicker drying, less gas evolution on casting, higher permeability in cores and less obnoxious fumes.

The "Sternocore" range includes oils, creams, and semi-solid pastes. The oils are of particular interest to those foundries which make their own core-binders, as they have been proved to be more efficient than natural vegetable oils for foundry purposes.

Dr. Skerl and other members of the technical staff will be pleased to welcome and assist all interested visitors to the stand.

NON-FERROUS CASTINGS

(STAND No. 10 G.)

Tungum Sales Company, Limited, Iddesleigh House, Caxton Street, London, S.W.1, show "Tungum" alloy, the main characteristics of which are its high resistance to metal fatigue, its ductility, workability, its resistance to corrosion by sea water, and by many acids, especially sulphuric, and its bearing qualities, which are excellent; "Tungum" is also non-magnetic and has a high thermal conductivity.

"Tungum" alloy is shown in the form of ingots, castings, etc., and of special interest are the propellers, propeller shafts, and the fact that by using one metal for these purposes, as also for "A" brackets, sheathing, rivets, cordage, etc., no electrolytic action can occur.

AIR-FILTERING

(STAND No. 19 G.)

Vokes, Limited, of 95-105, Lower Richmond Road, Putney, S.W.5, exhibit a wide range of apparatus for filtering air in compressor lines, a factor of outstanding importance in vitreous enamelling, and for dust collection, both by dry fabric filters and cyclone plants—equally important to many sections of the foundry industry.

MONEL METAL

(STAND No. 2 G.)

On the stand of *Henry Wiggin & Company, Limited*, Thames House, Millbank, London, S.W.1, a Monel pickling crate as used in the pickling of steel sheets prior to enamelling is exhibited, this crate being of riveted construction, while a specimen of an all-welded crate is also shown.

Aircraft manufacturers will be interested in the exhaust manifolds of "Inconel." This recently-developed nickel-chromium-iron alloy has a high resistance to the corrosive elements present in the combustion products of leaded fuels and in addition is practically immune from heat oxidation at temperatures as high as 900 deg. C. It is, therefore, particularly suitable for this application.

Another exhibit of interest is the moving belt laced with Monel belt fasteners by W. T. Nicholson & Clipper Company, Limited. Monel is particularly serviceable where corrosion- and abrasion-resistance are required. The belt drives an all-Monel Albany M.C. pattern rotary pump designed for the handling of certain corrosive fluids.

ELECTRIC FURNACES

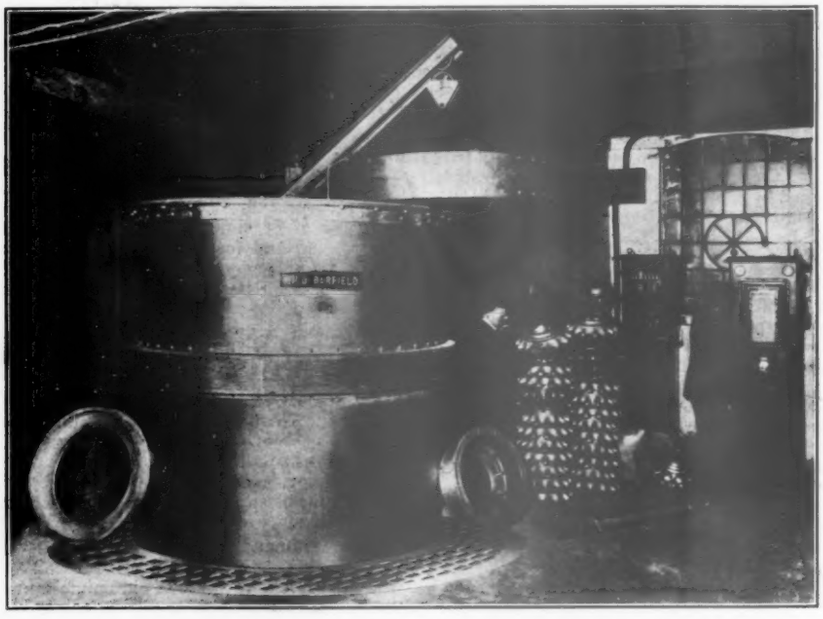
(STAND NOS. 1 A, MAIN HALL, AND 9 C, GALLERY.)

Wild-Barfield Electric Furnaces, Limited, of North Road, Holloway, London, N.7, show a wide range of furnaces. It is not, of course, possible to show all types of furnaces and new developments which have taken place recently, but equipments not shown are illustrated by a series of photographs taken of installations in various works. Small muffle furnaces, for use in laboratories and works where only occasional hardening is done, are represented in various sizes and types, such as horizontal rectangular and oval-sectioned muffles and also tube and vertical furnaces. These furnaces have a wide application and are in extensive use owing to their lasting qualities coupled with low initial and running costs. For the correct hardening of carbon and low alloy steels the Wild-Barfield electromagnetic furnace still holds the field and is exampled here by a vertical furnace.

Vertical furnaces with forced-air circulation are being shown in two standard sizes, one a small production equipment with the charge progress recorder for controlling the furnace temperature and indicating when the charge is up to tem-

perature, which saves much valuable time when heat treating large quantities of work. A smaller model of this type of furnace is also shown; this furnace is generally similar to the larger furnace mentioned above, but of somewhat simpler construction. These furnaces can be used for all types of low-temperature heat-treatment below 700 deg. C., such as tempering, secondary hardening of high-speed steels, annealing non-ferrous metals, solution and precipitation treatments of aluminium alloys, etc.

For higher temperature treatments up to 1,150 deg. C., there is shown a horizontal batch-type furnace with patented "Tubular-Hairpin" heating elements. For slightly lower temperatures "Heavy-Hairpin" elements are employed. Both these types give a robust construction and have very long useful lives.



ELECTRIC FURNACE FOR HEAT-TREATING OF ALUMINIUM-ALLOY CASTINGS, BY WILD-BARFIELD ELECTRIC FURNACES, LIMITED.

The Vickers Pyramid hardness testing machine is exhibited, and is available for actual testing of samples if required. As is well known this machine is unique amongst hardness testers for its accuracy and wide scope.

The furnaces manufactured by Wild-Barfield's associated company, *G.W.B. Electric Furnaces, Limited*, are too large for exhibiting, but they are illustrated by a large number of photographs. Heat-treatment shop requisites are fully covered by Eternite and Speedicase box case-hardening compounds, Kleenard open-hearth compound and Nokase anti-carburising mixture which are manufactured by them and are available for inspection. G.W.B. Electric Furnaces also distribute Shell-Wild-Barfield quenching oil, which is available in two grades, No. 1 for general use, and "Super" grade, a high grade oil, which forms a minimum of sludge and which is particularly useful for quenching cyanide hardened work.

FIRING FOUNDRY STOVES

(STAND NO. 7 J.)

The "Mirrlees-Combustioneer" is shown by *Mirrlees, Bickerton & Day, Limited*, Hazel Grove, Stockport. It is made in a range of ten sizes ranging from a minimum output of 17 lbs. of coal per hour on the smallest size up to a maximum of 1,200 lbs. per hour on the largest size. The standard hoppers have capacities ranging from 400 to 700 lbs., but larger hoppers, or hoppers of a special shape, can be supplied if required. The stoker exhibited is one of the smallest, actually the No. 5, and is used for central-heating boilers ranging from 170,000 to 1,500,000 B.T.U.'s per hour output, while the larger sizes are eminently suitable for industrial applications, including Sherardizing furnaces, annealing ovens, foundry core stoves, and forge furnaces.

Various methods can be resorted to for controlling the stokers, *e.g.*, thermostats for maintaining the correct temperature in a room, immersion control for use with hot-water boilers, and pressurestats for controlling steam pressure. All stokers employ the well-known "underfeed" method of operation, in which the fuel is fed upwards into the fire. This method has proved itself to be most efficient, as the gases liberated from the fuel pass through the incandescent part of the fire above and are completely burnt. This process transforms the original coal into coke, which then burns on top of the fire. Thus, it is apparent that the heat energy contained both in the gas and the remaining coke are used with maximum efficiency.

(*Concluded from next column.*)

bronze foundries. Late evening or overnight trip Cleveland to Detroit, or overnight boat trip Cleveland to Detroit.

Thursday and Friday, October 13 *and* 14.

GROUP A: Detroit: Automobile manufacture and production iron foundry, continuous strip rolling.

GROUP B: Detroit: Automobile manufacture and assembly, production iron foundry, large-scale electroplating, brass and bronze foundry.

Saturday and Sunday, October 15 *and* 16.

GROUPS A AND B: Either Detroit, Mich. or Chicago, Ill. Overnight or late evening trip Detroit to Chicago.

Monday to Friday, October 17 *to* 21.

GROUP A: Chicago: Joint Meeting of A.I.M.E. and American Society for Metals; attend National Metals Exposition; visit plants of U.S. Steel Corporation, Republic Steel, and possibly steel fabrication at A. O. Smith Corporation, Milwaukee, Wis. Overnight trip either to New York for week-end of the 24th, or Toronto, Buffalo, Niagara Falls or Montreal.

GROUP B: Chicago: Joint Meeting of A.I.M.E. and American Society for Metals; attend National Metals Exposition; visits to steel plants operating continuous strip rolling mills, Western Electric Company. Overnight trip either to New York for week-end of the 24th, or Toronto, Buffalo, Niagara Falls or Montreal.

Metallurgical Institutes to Visit U.S.A.

A preliminary notice circulated to all members of the Iron and Steel Institute and the Institute of Metals points out that the Councils of these Institutes have much pleasure in announcing that they have each received a very warmly-expressed invitation from the American Institute of Mining and Metallurgical Engineers and the American Iron and Steel Institute to hold the Autumn Meeting of 1938 in the United States of America. These invitations have been accepted. It is proposed that the Autumn Meetings of the two Institutes shall be held in New York and that they shall be followed by tours which will enable members to visit laboratories, works and places of general interest. Ladies are cordially invited to attend and programmes of special interest to them will be prepared. The joint programme will be prepared and arrangements in the United States made by the two Institutes in conjunction with a committee of the American Societies specially appointed for the purpose. Special travelling arrangements will also be made and will be available to members of either Institute. It is probable that an opportunity will be given to members who wish to curtail their visit and return after about a fortnight, while it is also probable that extensions will be arranged for those who prefer to make a longer tour.

Outlines of a provisional programme are appended, and full details will be issued when available. The general proposals at present under consideration are that the meeting shall open in New York on Monday, October 3, with a Joint Meeting of the American Institute of Mining and Metallurgical Engineers, the American Iron and Steel Institute, the Institute of Metals and the Iron and Steel Institute; the joint meeting will be followed by a banquet.

Provisional Programme

It should be noted that Group A is of predominantly ferrous interest and applies particularly to members of the Iron and Steel Institute, while Group B is primarily non-ferrous.

Monday and Tuesday, October 3 *and* 4.

GROUP A: Technical Sessions of the Iron and Steel Institute.

GROUP B: Technical Sessions of the Institute of Metals.

Wednesday, October 5.

GROUP A: Visit to plants of Bethlehem Steel Company, either at Bethlehem, Pa., or Sparrows Point, Maryland. Wednesday night, overnight trip to Pittsburgh, Pa.

GROUP B: Visit to Atlantic Seaboard copper refineries near New York.

Thursday and Friday, October 6 *and* 7.

GROUP A: Pittsburgh: Visit to plants of the U.S. Steel Corporation, Jones & Laughlin Steel Corporation. Friday night, overnight trip to Washington.

GROUP B: Visit to brass and copper rolling mills, Naugatuck Valley, Waterbury, Ansonia, Bridgeport. Friday night, overnight trip to Washington.

Saturday and Sunday, October 8 *and* 9.

GROUP A: Washington: Government Bureaux and general sightseeing. Sunday night, overnight trip to Pittsburgh.

GROUP B: Washington: Government Bureaux and general sightseeing.

Monday to Wednesday, October 10 *to* 12.

GROUP A: Pittsburgh, Pa., Canton, Ohio and Youngstown, Ohio: Plants of the U.S. Steel Corporation, Jones & Laughlin, Republic Steel, Youngstown Sheet & Tube: blast furnaces, coke ovens and slab mill, continuous strip rolling, pipe manufacture, alloy and stainless steel. Probably late evening or overnight trip Pittsburgh to Detroit.

GROUP B.

Monday, October 10.—Baltimore: copper refinery. Overnight trip Baltimore (Maryland) to Pittsburgh, Pa. *Tuesday, October* 11.—Pittsburgh, Pa.: Aluminum Company laboratories and plants and Mellon Institute. *Wednesday, October* 12.—Cleveland: Cleveland Wire Works, General Electric, brass and

(*Concluded in previous column.*)

THE WELDING EXHIBITION

The Welding Exhibition at Olympia is, we believe, the first commercial exhibition organised by the welding industry itself. It is exceptionally complete and is really representative of the equipment and material available. Foundrymen should examine these exhibits carefully, as all types of welding, except electric resistance methods, are used in the industry. At the moment, welding in the foundry is only used for the reclamation of slightly defective castings, but the future may see a real development in composite structures made by taking advantage of the best features of casting and welding. Below we give details of the major exhibits.

BRITISH ACETYLENE ASSOCIATION

(STAND No. 11 D.)

This Association, which has its offices at 64, Victoria Street, Westminster, London, S.W.1, has assembled an impressive number of components which have been either fabricated or mended by means of the oxy-acetylene blowpipe. From the London Passenger Transport Board there is a six-cylinder Elektron crankcase, a cast-iron camshaft, a cylinder head and an aluminium oil-engine head, whilst a number of stellited tools have been lent by the Deloro Smelting & Refining Company, Limited. Examples are shown of welded "Staybrite" steel, aluminium, Monel metal, components for aircraft, electric meters and numerous repairs to castings.

OXY-ACETYLENE WELDING

(STAND No. 9 F.)

On the *British Oxygen Company's* stand it will be noted that, in general, the emphasis of the exhibition is on improved techniques of welding rather than on new types and models of plant and equipment. Keen observers can detect, however, minor refinements in blowpipes, cutters, machines and regulators, due to reorganised production methods at the company's works.

As regards equipment for welding and cutting, the visitor has the opportunity of inspecting and having demonstrated the following items from the B.O.C. range: "Alda" portable high-pressure oxy-acetylene welding outfits, Models A, B and O. All sections of metals can be welded with these equipments, the A model being designed for thicknesses up to ½ in., B for thicknesses up to 1 in., and O for work on light steel and for burning lead. Sheet metal workers, coachbuilders and heating and ventilating engineers are among the chief users who employ the "Alda" Model A outfit in production. To name the trades utilising the Model B outfit would be an invidious task in view of its universal use. The applications of this welding blowpipe, however, may be broadly classified as maintenance and production. In every place where machinery is in use or vehicles are employed, such as factories, institutions, power stations and transport concerns, by the speedy repairs and services of an outfit, maintenance costs are kept down. Production uses of the Model B range over the whole field of metals. The ease and economy of jointing by welding, the improved designs made possible by its use, the saving of weight and, above all, the simplicity of the process, have brought the "Alda" Model B welding outfit into general use.

Oxy-acetylene equipment for cutting runners and risers from castings includes the familiar H, MS and C types of B.O.C. handcutters. This year, in addition to the now well-known L type cutter, visitors have the opportunity of seeing tried out the new light pattern cutter, type No. 9. This has been specially designed for sheet steel.

For service with the welding blowpipe and cutters mentioned, the company manufacture a range of gas pressure regulators, the principal types of which may be seen on the stand. The staff will gladly advise on the standard equipment referred to and give any assistance in respect of special requirements such as the provision of gas pipelines and manifolds.

As manufacturers of the well-known range of "Alda" welding materials, the company have a representative range of welding rods and fluxes on their stand. In view of the ever-increasing use of metals and the introduction of new alloys, particularly of the non-ferrous category, a special feature is made of giving advice upon the correct materials and technique to use for each material upon the jointing of which help is sought.

Among the oxygen cutting machines to be demonstrated, visitors may see the B.O.C. 55 in. and 20 in. types, the popular portable straight-line and circle-cutting machines, and machines for cutting rails and joists. The first two tools mentioned are power-driven fixed type machines utilising the principle of the magnetic roller. Machines of this category are invaluable production tools. They enable users to produce singly or in batches any quantity of a desired shape from mild steel plate with a precision rivalling that of mechanical power-driven machine tools.

Since the previous Shipping and Engineering Exhibition, great attention has been paid to the methods employed in welding different classes of work. For example, in the jointing of large pipes, such as those which gas, oil and water companies lay down for their services and products, improvements in technique and in the procedure of pipe-laying have made great economies possible. The technique recommended by the company which is being demonstrated on the stand is known as the Linde process.

A special feature of the demonstrations of improved techniques is instruction in rightward welding and two-welder vertical welding. Since the company first advocated these techniques, demonstrations have been held throughout the country with such success that many large users of welding have changed their practice. The technique for welding fire-boxes and other structures of copper is also being demonstrated on the stand. Aluminium welding and the techniques to use when welding non-ferrous alloys are to be seen from time to time.

METAL-SPRAYING AND ITS APPLICATIONS

(STAND No. 9 F.)

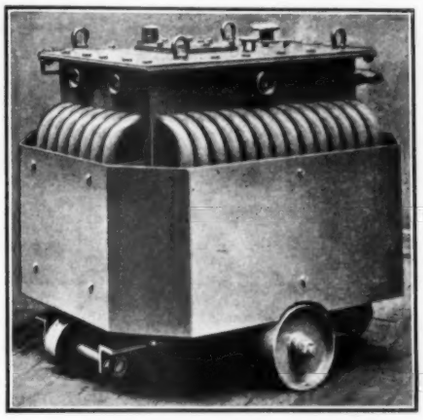
In the section devoted to metal spraying on the *British Oxygen Company's* stand a complete metal-spraying plant is in use. This consists of the pistol (special nozzles of the rotary extension and deflector types are exhibited near at hand), cylinders of oxygen and hydrogen, tubing, regulators, and an Ingersoll-Rand type No. 30 air compressor. A small lathe is employed to demonstrate the building up of worn parts by the use of the pistol. These demonstrations include the deposition of high and low carbon steels as required in the rebuilding of such parts as crankshafts, stub axle pins, ball race journals and housings.

The application of zinc by the pistol for protection against corrosion and of aluminium for heat protection is also demonstrated. Aeroplane parts such as manifolds which have been treated in this way are exhibited, together with a selection of pottery sprayed with various metals to show the use of the pistol to secure attractive effects and designs in decoration. This should interest vitreous enamellers. The deposition of copper, bronze and Swedish iron by means of the pistol is also being carried out to show the value of these metals for protective and other purposes.

A.-C. ARC WELDING EQUIPMENT

(STAND No. 12 H.)

On the stand of the *English Electric Company, Limited*, Queen's House, Kingsway, London, W.C.2, is a representative range of their A.C. arc welding equipment. A multi-operator equipment which is shown comprises a transformer and three sizes of welding regulators. The transformer is suitable for supplying three welding regulators capable of welding up to a maximum of 300 amps. The transformer is connected delta inter-star, which gives the maximum equal distribution of current in the primary side under welding conditions. The welding regulators are of the oil-immersed self-cooled type. An externally-operated switch located in the cover of the regulator is provided for selecting current values to suit the particular electrode being used; either 24 or 36 steps are provided, according to the size of the regulator, these being suitably graduated over the complete range.



600-AMP. PORTABLE WELDING EQUIPMENT, BY THE ENGLISH ELECTRIC COMPANY, LIMITED.

The portable equipments shown are of the oil-immersed self-cooled type, and comprise a welding transformer and regulator located in one tank. Insulated and mechanically-interlocked plug and socket connectors are provided for connecting the transformer to a 415 volts power supply. Similar connectors are provided for connecting the regulator to the electrode holder. An externally operated switch located in the tank cover is provided for selecting current values.

Both the multi-operator and portable equipments are of very robust construction and weatherproof for outdoor service without any further protection. They are thus eminently suitable for the rough usage likely to be met with in foundries and fabricating shops.

GAS-WELDING EQUIPMENT

(STAND No. 26 A, GALLERY.)

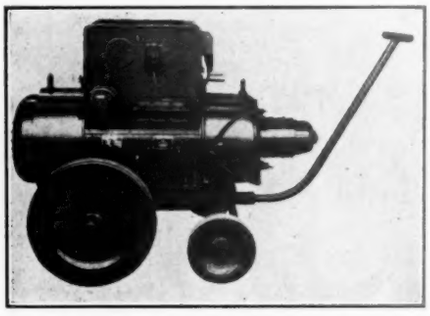
Equipments, Limited, of 152, Great Portland Street, London, W.1, are showing portable sight-feed pressure acetylene generators, which present an entirely new outlook on acetylene welding and cutting, inasmuch as they have the portability of cylinders plus an important saving on the cost of acetylene. They are entirely automatic, as gas is only generated while the actual work is being done, with no over or after generation. They deliver clean, cool acetylene at the required pressure, and are extremely safe, and there is no heavy sludge.

The Sterling speed bloc air-driven sander which is shown should interest foundry owners, as it is apparently popular amongst them in America. It weighs 5½ lbs., has a reciprocating motion with ⅛ in. stroke at 3,000 pulsations or oscillations per minute, and duplicates the hand motion for rubbing down or sanding (wet or dry) flat or curved surfaces. It is supplied with a flexible rubber pad for curved surfaces or a stiff (Sterlite) pad for flat work. The consumption of air is very low, being approximately 5 ft. per min. at maximum speed.

ARC WELDING SETS

(STAND No. 27 A, GALLERY.)

As far as space limitations allow, the *Fuller Electrical & Manufacturing Company, Limited*, Fulbourne Road, Walthamstow, London, E.17, are showing a comprehensive range of equipment and apparatus covering the whole field of arc, spot and seam welding. As the stand is divided into two sections, one being devoted entirely to



60/600-AMP. MOTOR-GENERATOR ARC WELDING SET, BY THE FULLER ELECTRICAL & MANUFACTURING COMPANY, LIMITED.

arc welding and the other to resistance welding, foundrymen can ignore the latter.

The most interesting exhibit from our readers' point of view is the 60/600 ampere welding set, which, because of its high capacity, is not only suitable for the reclamation of defective castings, but also can be used as a carbon-arc process for the cutting of runners and risers.

SAFETY GOGGLES

(STAND No. 26 B, GALLERY.)

Fleming Safety Goggles, a department of J. & R. Fleming, Limited, of 146, Clerkenwell Road, London, E.C.1, wholesale manufacturing opticians, display a range of goggles for welding, foundry and workshop requirements. A notable feature in their goggles is the roominess of the eye-cups, giving a degree of comfort in wear, not often found, that is essential to efficiency in the worker. The rims are chiefly made to take the 2 in. lenses recommended by the British Standards Specification No. 679.

It is further noted that several of the goggles shown may be worn over ordinary spectacles, notably their "Overspec" goggle, "Coverglass," and welders' goggles. The "Overspec" goggle has a patent adjustable spring bridge, which, being flexible without the looseness of the chain or elastic bridge, makes for general comfort. This goggle is shown in anodised, as well as plain, aluminium.

Welding shields are also included in this exhibit, and J. & R. Fleming specialise in tinted glasses for these and lenses for goggles. Their "Arcwel" welding glass complies with the B.S. Specification No. 679, and the "Arcan" and "Arkos" glasses are also widely used. For furnace work their "Infrex" glass carries a long and wide reputation. In addition to the "Super Armorplate" lenses, laminated "Link Safety" and other lenses are shown.

ELECTRIC WELDERS

(STAND No. 10 D.)

Mawdsley's, Limited, Dursley, Glos, show a multi-operator welding plant for three operators, including a typical welding bench, and a second one of the tandem type, all coupled up and equipped ready for use. This exhibit should be of particular interest to all who have several operators using a d.c. arc. An interesting exhibit is a tandem marine-type welding plant, d.c. to d.c.

A petrol engine-driven transportable d.c. welding set, powered by a Morris industrial-type engine, is also shown, together with two single-operator tandem-type d.c. sets, one mounted on a Tuglift chassis and the other fitted with an alternative light plate welding circuit. The last is being used to give demonstrations on the stand.

BLOWPIPES AND REGULATORS

(STAND No. 14 C.)

C. S. Milne & Company, Limited, Harley Works, Octavius Street, Deptford, London, S.E.8, have a number of exhibits of paramount interest to foundrymen in the direction of acetylene generation and use. Primarily, there is the

NEW SET OF BLOWPIPES, WITH CUTTING HEAD ATTACHMENT, BY C. S. MILNE & COMPANY, LIMITED.

C type carbide-to-water self-desludging generator, which has been partially sectioned so that its operation can be seen. This generator is operated by the water pressure of the town mains, and the exhaust water from the operating engine is used to generate the gas and eject the residue. A further special feature is its ability to work for some months without any cleaning out. Then there is a pressure booster, direct coupled to an electric motor for delivery of acetylene at any desired pressure up to 22 lbs. per sq. in. It is advantageous for shops where the welding stations are widely dispersed. Its special features are the water-sealed rotor to prevent friction or heating, and the weight-loaded regulating device, which gives steady outlet pressure under varying loads. There are also a number of other useful accessories, but attention should be given to a new and complete range of blowpipes, which includes a convenient cutting head attachment.

ELECTRODES

(STAND No. 11 E.)

Murex Welding Processes, Limited, of Ferry Lane Works, Forest Road, London, E.17, have long specialised in the production of electrodes and unquestionably possess a scientific background and control. For non-ferrous castings there are rods of Monel metal, copper, brass and bronze, whilst for manganese steel a rod giving 12 to 14 per cent. of manganese in the weld is shown. "Hardex" is recommended for mending excavator buckets and plough shares—special literature is available on this subject. Two types of electrodes are available for cast iron, one of the extruded variety, with a soft iron core, and the other a dipped electrode with a special core wire. The former is used for repairing castings where the studding process is used. A third one containing nickel is shown, for which a claim of enhanced machinability is made. For steel castings they show a rod which gives 30 tons tensile with good elongation in the weld metal.

ARC-WELDING PLANTS

(STAND No. 12 B.)

G. D. Peters & Company, Limited, of Windsor Works, Slough, Bucks, are exhibiting examples of their well-known "Plastic Arc" electric welding plants, both for hand and fully automatic operation, together with a complete range of "Colour-Tipt" electrodes, including lightly-coated, fully-fluxed spirally wound and solid extruded shielded arc types.

The latest "Plastic Arc" model "Q" combined-unit type of motor-generator hand-welding plant is available for demonstration. This machine, apart from its special electrical characteristics, is of particular interest, because of its compact design and extremely neat external appearance. The motor is of the flange-connecting type, with flange-fitting coupling end and ball and roller bearing endshield. It is bolted to the generator frame through a spacer ring and connected to the generator armature shaft by means of a butt coupling. A common ventilating fan is fitted between the two armatures, and the two machines are housed in the one carcase to form a single unit.

The welding generator is of the four-pole drooping characteristic type, designed to give its stated output at an open circuit voltage of 70 volts, which droops automatically on load to the required arc voltage, according to the type of electrode employed. Welding current control is by means of a small differential regulator working in conjunction with a three-point selector switch connected to tappings in the field windings of the generator. This method of control provides infinite current variation within the range of the machine and eliminates altogether the necessity for wasteful and unsightly external resistances. The welding controls are fitted into a light-weight sheet-metal control box, which, together with the motor starter, is mounted on top of the motor generator unit.

WELDING MACHINES AND ACCESSORIES

(STAND No. 10 C.)

Philips Industrial (*Philips Lamps, Limited*), 145, Charing Cross Road, London, W.C.2, show electrodes suitable for welding cast iron (No. 38

and G.M.), managanese steel (No. 200), aluminium (Al) and for phosphorus bronze (Br). Amongst accessories there is a light-weight arc-welding face screen, which has much to commend it. The main exhibits, however, are electric welders, which are shown in a number of types specially designed for specific purposes.

ELECTRODES

(STAND No. 11 G.)

The *Quasi-Arc Company, Limited*, of 15, Grosvenor Gardens, London, S.W.1, were the first firm in this country, possibly in the world, to manufacture and supply electrodes for arc welding having a flux covering with the necessary metallurgical properties to produce a reliable arc weld. For over twenty years they have supplied electrodes and welding sets and, in addition, have given advisory services on all matters connected with welding to their users.

As their products are so well known, and also as it is difficult at an exhibition to deal satisfactorily with welding matters by practical demonstration, the company are not showing any of their equipment or electrodes in operation. However, they have available full information in respect not only of all their products, but of the applications, and members of the technical staff are available to give any advice in connection with the use of welding.

The Quasi-Arc Company have introduced within the past few years an improved type of electrode for the welding of mild steel, known as the "T" type, which has passed all the tests required by the classification societies. They also have a new static transformer set for three-phase A.C. supply, which should be of particular interest in that it can be connected to three phases and take a truly balanced load from the mains. Another feature is that the output frequency given to the arc is three times that of the input frequency; in other words, on a 50-cycle supply 150 cycles per second are given to the arc, thereby improving stability and assisting generally the operation of welding.

ELECTRODES AND WELDING PLANT

(STAND No. 10 F.)

Rockweld, Limited, is a British company manufacturing under licence, in a new factory at Commerce Way, Croydon, various types of electrodes produced and sold in large quantities in Europe. The electrodes are made by a mechanised dipping process under conditions which ensure a consistent product at all times, both as regards the constituents of the coating and its thickness. All the electrodes manufactured have the distinction of being pointed, which permits easy starting of the arc. Every batch of electrodes is tested not only for running, but also for mechanical properties, before being passed out of the factory.

The range of mild steel electrodes shown includes the "Stabilend," an electrode which has gained a high European reputation. The deposited metal from this electrode has a tensile strength not higher than the specified upper limit of good-quality mild steel, and a ductility which will permit of it passing the most severe bend test such as is demanded by Lloyd's pressure vessel code. The firm are also showing electrodes for welding aluminium, cast iron, various types of stainless steel and non-ferrous metals, and these make an extremely interesting exhibit.

The plant on the stand includes a motor generator set, transformers and light-gauge welders. The motor generator set is of the portable, single-operator drooping characteristic type, manufactured by Brown-Boveri, and has been specially developed to provide ease of control and stability of the welding arc. The transformers shown are specially manufactured by La Soudure Electrique Autogene, S.A., and are both air-cooled, single-operator, portable units, with continuous choke-regulation. One of these is a normal single-phase set with a current range of 35/300 amps. The other is a very special three-phase/single-phase unit.

PROTECTIVE GOGGLES AND CLOTHING

(STAND No. 14 G.)

Safety Products, Limited, St. George's House, 44, Hatton Garden, London, E.C.1, are making the main feature of their display Chance's "Protex" arc screen glass, which tests have proved to comply with the requirements set out in B.S.S. 679. There is an instrument on the stand which shows how various types of glass permit of the passage of infra-red and ultra-violet rays, which are stopped by Chance's "Protex" glass. The various densities of the glass are being demonstrated and shown mounted in the Pulsafe welding goggles, helmets, hand-shields, etc.

In addition there are respirators, clothing, aprons and gloves for foundry use, all designed with a view to the maximum comfort and safety of the wearer.

Mr. W. Watson is personally supervising the stand.

TESTING MACHINES

(STAND No. 16 G.)

Tensometer, Limited, of 81, Morland Road, Croydon, Surrey, have on their stand a range of testing machines and instruments for use in connection with the determination of the mechanical properties of metals and other materials. The policy of the firm is to provide small apparatus requiring small test-pieces, with special facilities for producing the test-pieces cheaply and accurately.

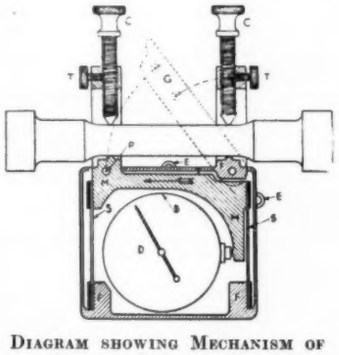


DIAGRAM SHOWING MECHANISM OF GERARD EXTENSOMETER, EXHIBITED BY TENSOMETER, LIMITED.

The Hounsfield Tensometer is made in two types, both capable of giving the usual properties associated with tensile testing, *i.e.*, maximum stress; yield point; fracture strength; elongation per cent. and reduction in area per cent. Attachments enable the following tests to be made:—Notched bar, cast-iron transverse, uniform bending moment, punch shear, compression, cupping, Brinell hardness, etc. The simple manner in which the results of these tests are given on autographic records makes the machine particularly useful where records are kept and where uniformity is important.

The Gerard Extensometer shown, although compact and robust, enables extensions of 0.005 per cent. of the gauge length to be measured. The mechanism (see diagram) is simple, comprising the frame and fixed parts marked F and a moving clamp and member M (the parallel motion of which is effected by the springs S) which transmit the extension of the test-piece to the sensitive dial indicator D. Each division represents an extension of 0.005 per cent. of the 2-in. gauge length, or one revolution of the pointer over the scale 5 in. long represents an extension of 0.01 in. The distance between the gauge points may be locked at the gauge length (2 in.) before clamping on to the test-piece, thus obviating prior marking of the test-piece. The locking gate G also locks the adjustable bezel B of the indicator, and in addition provides means for preventing the instrument from falling off the test-piece, hence the risk of the test being started without unlocking is avoided. It can be used on strip up to 1⅛ in. wide, and on round bar up to 1.128 in. dia. (1 sq. in. area).

For making a test, assemble the test-piece in the testing machine and apply a small load. Then suspend the extensometer on the spring provided, attaching the other end of the spring with string to some suitable support, and with the locking pin P still holding the gate G in the locked position, mount the extensometer on the test-piece and nip the latter with the clamping screws C on the centre line, then lock these screws with the thumb screws T. Before taking the hands away, remove the locking pin P and secure the gate in the open position, shown dotted. This not only unlocks the gauge length and releases the bezel adjustment, but prevents the instrument from accidentally falling from the test-piece. After, set the dial to zero, proceed with the test by applying successive increments of load and record the dial reading for each load in the usual way.

This type of extensometer has been approved by the Mechanical Industry Committee of the British Standards Institution, and is in general use by a large number of the leading foundries and technical colleges in this country to-day.

The Hounsfield balanced impact tester and miniature weld tester (dealing with test-pieces $\frac{5}{16}$ in. and $\frac{1}{8}$ in. dia. respectively) are machines in which both the energy and the velocity of the blow are very great compared with the size and weight of the machines. As no bed plate or foundation is necessary, the machines are portable, and special tools are provided to enable the test-pieces to be made quickly and cheaply. All machines can be calibrated in English or metric units.

OXY-ACETYLENE WELDING AND CUTTING

(STAND No. 13 B.)

Thirty-one years have passed since *Thorn & Hoddle, Limited*, 151, Victoria Street, London, S.W.1, introduced their oxy-acetylene welding and metal cutting equipment to engineers on their stand at the first Engineering Exhibition, held at Olympia in 1906. At the present exhibition they are showing the latest type of water-to-carbide generators which, although in general appearance resembling their predecessors of 1906, nevertheless embody improvements in manufacture and operation incorporated as a result of constant development in technique. They are now welded by the oxy-acetylene process and galvanised after manufacture. Amongst plants shown are the water-to-carbide "K" pattern for stationary use, and various portable types for work *in situ*. There is a comparatively recent carbide-to-water model, the "Eveready," the chief feature of which is that it ceases to generate directly work is suspended, and is instantly at service when operations are resumed.

Although not exhibited on the stand for reasons of space, the company also manufactures large carbide-to-water generators, and has recently installed such a plant for what is probably the largest oxy-acetylene welding organisation in Europe, a Luton factory where 300 welders are employed.

In blowpipes there is a very full range for welding or cutting, all fitted with a patent non-backflash injector which relieves the operator from back-firing troubles. Pressure regulators and other accessories are on view, and in addition to the usual rods and fluxes there is the "Chameleon" brand for low-temperature welding. Welding and cutting demonstrations are being given at intervals.

(*Concluded on page* 232.)

Some Observations on the Addition of Silicon and Tin to Grey Iron*

By DR. E. VALENTA and N. CHVORINOR

Whilst no detailed treatment is attempted, the authors present in the following Paper certain observations and conclusions concerning the metallurgy of grey iron which are the outcome of investigations not immediately directed to this end. Nevertheless, these observations possess some practical interest and may serve as the starting point for further research.

During recent years attention has been attracted to the addition of various elements to grey irons, and particularly to that of nickel, chromium and molybdenum, and to the physical condition of the metal in so far as it is influenced by melting practice. Broadly speaking, it

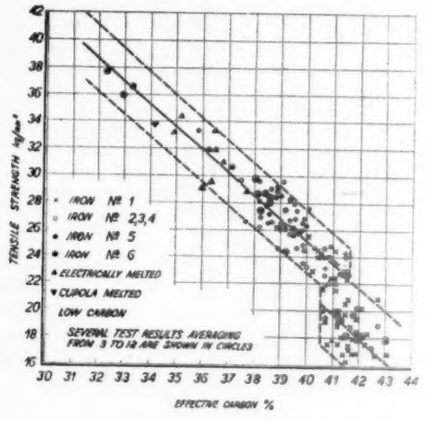


FIG. 1.—EFFECT OF CARBON CONTENT ON TENSILE STRENGTH.

may be said that according to the particular melting procedure employed for irons of a given chemical analysis, different types of graphitisation result, leading to modifications in structure, mechanical properties, and foundry properties for any one rate of cooling.

According to Norbury, two types of graphitisation must be distinguished, namely, normal graphitisation and "supercooled" graphitisation; mixed graphitisation is a combination of both types.

"Normal" iron is characterised by the occurrence of the graphite in the form of regularly distributed flakes exhibiting no specially preferred orientation. "Supercooled" iron is characterised by the presence of finely distributed graphite arranged according to a regular system (known as graphite-eutectic), often accompanied by an entirely ferritic matrix. Furthermore, distribution occurs along the dendrites. The processes of graphitisation may, however, be still further differentiated, and clearly depend on the conditions of physical dispersion of non-metallic phases in the molten metal.

The phenomenon of heredity is definitely in agreement with the influence of these dispersive agents, and the effect of fusion slags in electric furnace and crucible melting practice is equally a manifestation of the influence of disperse phases of non-metals on graphitisation. These considerations may be summarised, and the dual aspect of the influence of such additions emphasised, as follows:—(1) Modification of composition results is modification of technical and mechanical properties, structure and type of graphitisation, and (2) independent of changes in chemical composition, modifications occur in the physical condition of the molten charge and particularly in the dispersion of the non-metallic constituents. These two modes of action should not be confused. The authors postulate as an important hypothesis that for a given physical condition of the molten iron, the foundry and mechanical properties of the metal are exclu-

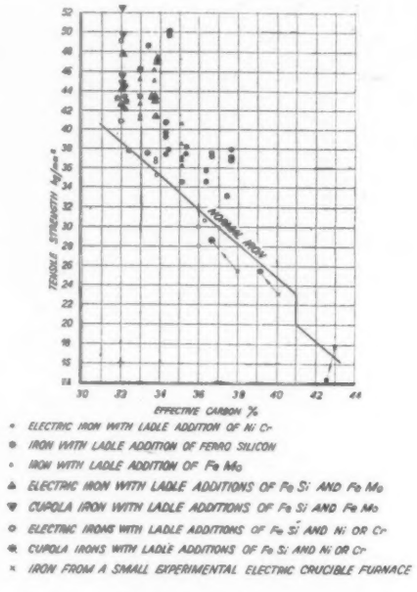

TENSILE STRENGTH kg/mm²
NORMAL IRON
EFFECTIVE CARBON %
ELECTRIC IRON WITH LADLE ADDITION OF Ni Cr
IRON WITH LADLE ADDITION OF FERRO SILICON
IRON WITH LADLE ADDITION OF Fe Mo
ELECTRIC IRON WITH LADLE ADDITIONS OF Fe Si AND Fe Mo
CUPOLA IRON WITH LADLE ADDITIONS OF Fe Si AND Fe Mo
ELECTRIC IRONS WITH LADLE ADDITIONS OF Fe Si AND Ni OR Cr
CUPOLA IRONS WITH LADLE ADDITIONS OF Fe Si AND Ni OR Cr
IRON FROM A SMALL EXPERIMENTAL ELECTRIC CRUCIBLE FURNACE

FIG. 2.—EFFECTS OF ALLOY ADDITIONS ON TENSILE STRENGTH.

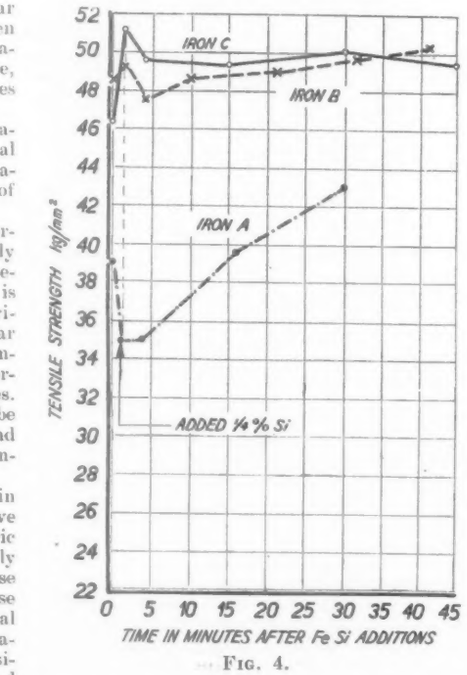


FIG. 4.

sively a function of its chemical composition and cooling rate.

In a previous study of the mechanical properties of grey iron (Paper read before the International Foundry Congress, Prague, 1933 "Contribution à la definition plus exacte des propriétés mécaniques de la fonte et des pièces coulées"), the authors presented the diagram reproduced in Fig. 1, which lent support to the above hypothesis in a large number of experiments. It represents the variation of tensile strength of grey iron as a function of chemical composition in terms of "effective carbon content"; this expression is defined in the Paper cited above. Irons of eutectic composition are seen to exhibit the largest variation in mechanical properties (up to 5 tons per sq. in. in tensile tests); the cause of this is that according to *slight* variations in chemical composition, method of manufacture, and the quality of the raw materials, the metal will behave either as a hypoeutectic or hypereutectic (precipitation of primary graphite) alloy. The results presented in Figs. 1 to 6 were all obtained on standard test pieces 30 mm. dia. cast in warmed moulds

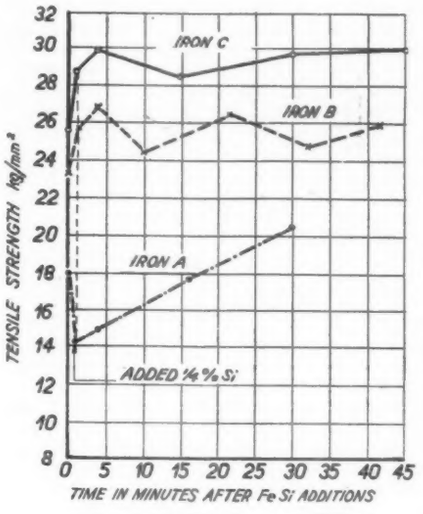


FIG. 3.

and finally machined to 20 mm. in accordance with Czecho-Slovakian standard specifications. Fig. 1 refers to irons on the borderline between the normal and "supercooled" types. The excellent agreement between mechanical properties and chemical composition is to be attributed to the similarity in physical condition between the metals in the liquid state. The procedure adopted was such as to eliminate either entirely, or to a large extent, all hereditary factors, that is, to remove disperse phases of a non-metallic nature in the form of inclusions existing as emulsions or suspensions. Melting was carried out in a cupola provided with a forehearth and operating under high pressure blast (above 1,000 mm. water-gauge). The fusion zone was thus very high, and, with a slightly higher coke-consumption, a very hot iron was obtained of very constant properties which depended only to a small degree on the quality of the raw materials forming the charge, thus leading to a decrease in cost price which far outweighed the increased melting costs.

If, by means of additions, the physical condition of such an iron is altered, a corresponding alteration accords in its mechanical properties. The addition of nickel or of nickel-chromium mainly alters the chemical composition and tends to increase the strength of the matrix—a factor of some importance for example in connection with wear-resistance—without entailing any serious variation in mechanical properties however.

On the other hand, it has been shown that some additional elements exert a powerful effect on the physical condition of the molten iron, and, in consequence, strongly modify the mechanical and foundry properties of the metal. Among such elements may be cited silicon, the

* A Paper presented to the International Foundry Congress held in Paris.

effects of which are already well known to foundrymen, and tin, which is less well known as an alloying element.

In Fig. 2 are shown the results of tests on irons to which either nickel or nickel-chromium, or 90 per cent. ferro-silicon have been added in the ladle. The properties of a normal iron are included as a standard of comparison. The additions were made to a hand ladle of 50 to 100 kg. capacity, and to a larger ladle of 3,000 to 4,000 kg. capacity used in conjunction with an electric furnace. It is clear that the addition of nickel-chromium exerted little, if any, effect on the strength of such an iron. Conversely, the addition of high-silicon ferro-silicon produced a marked increase on the strength of hypoeutectic irons, particularly in conjunction with low carbon contents. Otherwise expressed, the increase in strength is more pronounced the more marked the hypoeutectic quality of the iron.

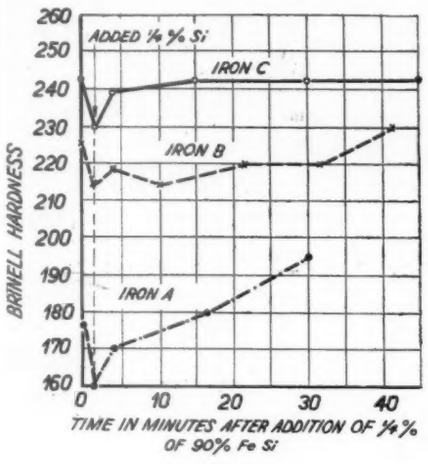


Fig. 5.

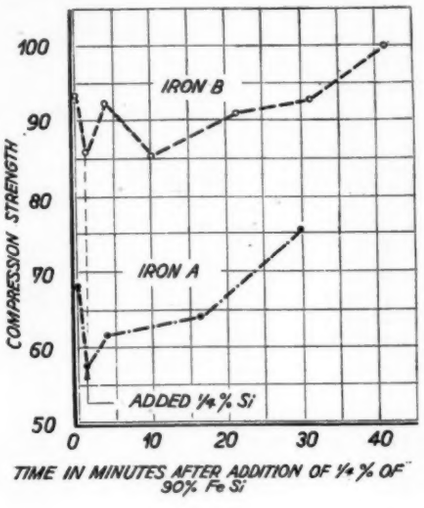


Fig. 6.

Table I.—*Chemical Composition of Iron with Tin Additions.*

Iron.	C	Si	P	Sn.	
A1	3.66	1.97	0.53	0	As-cast (crucible electric furnace).
A2	3.56	2.40	0.53	0	After the addition of ½ per cent. ferro-silicon.
A6	3.52	2.20	0.53	0.56	After the addition of ½ per cent. tin.
A7	3.52	2.20	0.53	1.02	After a final addition of ½ per cent. tin.
B1	3.40	2.08	0.50	0	As-cast (crucible electric furnace).
B2	3.23	2.30	0.50	0	After the addition of ½ per cent. ferro-silicon.
B7	3.23	2.30	0.50	0.63	After the addition of ½ per cent. tin.
B8	3.23	2.30	0.50	1.02	After the final addition of ½ per cent. tin.
C1	3.24	2.12	0.52	0	As-cast (crucible electric furnace).
C2	3.01	2.33	0.52	0	After the addition of ½ per cent. ferro-silicon.
C6	2.90	2.33	0.52	0	After holding at the melting temperature for 45 min.
C7	2.89	2.33	0.52	0	After the addition of 0.2 per cent. ore.
C8	2.89	2.33	0.52	0.54	After the addition of ½ per cent. tin.
C9	2.89	2.33	0.52	0.93	After the final addition of 1 per cent. tin.
D1	3.48	2.00	0.33	0	As-cast (crucible electric furnace).
D2	3.48	2.00	0.33	0.08	After successive additions of tin.
D3	3.48	2.00	0.33	0.40	
D4	3.48	2.00	0.33	0.57	
D5	3.48	2.00	0.33	0.84	
D6	3.48	2.00	0.33	1.08	
E1				0	As-cast (crucible).
E2				0.09	After successive additions of tin.
E3				0.20	
E4	3.35	1.82	0.24	0.32	
E5				0.40	
E6				0.47	
F1				0	As-cast (crucible).
F2				0.19	After successive additions of tin.
F3				0.39	
F4	3.44	1.95	0.21	0.62	
F5				0.87	

It is interesting to note that tests on irons containing no special elements and with approximately 2.0 per cent of silicon, gave tensile figures approaching 50 kg. per sq. mm. (31 tons per sq. in.) on test-bars 30 mm. dia.; since no heat-treatment was given, this is an exceptional result. Another interesting feature was that graphitisation was normal, that is the structure showed graphite flakes, without the slightest tendency to supercooling. Such an iron has, therefore, little tendency to chill, and may be employed for castings of small section. An iron of this type with a composition in accordance with the section of the casting produced, gives an unusual velvety fracture, in which the primary crystallites may be distinguished.

Fig. 2 also shows that ladle additions of ferro-molybdenum give rise to analogous results, and the simultaneous addition of ferro-silicon is shown to produce no augmentation of the effect. In the same figure similar results are indicated for three irons of almost identical composition excepting for variations in carbon content, which were melted without slag in an electrical resistance crucible furnace. As a result of slight superficial oxidation, there was a tendency for "supercooled" graphite to form in these cases, and the fracture was blackish and showed preferentially accentuated graphite.

The tensile strength and deflection tests on such irons are lower in the case of cupola melts, but their compressive strength and hardness are increased. Fig. 2 indicates that the addition of 1.4 per cent. of 90 per cent. ferro-silicon increases the strength of hypoeutectic irons and decreases that of hypereutectic irons.

Figs. 3 to 6 present a complete view of the variations in mechanical properties on the one hand after casting immediately, with or without the addition of ferro-silicon, and on the other hand after holding at a temperature corresponding to the molten state for given periods of time. If after the addition of 90 per cent. ferro-silicon the charge is maintained in the liquid condition for a certain time, the metal returns to its original state, and no relationship can be detected between the causes of the modification of its physical state and the final chemical composition. One hypothesis postulates the local precipitation of graphite during the addition of silicon. Supposing that during the dissolution of the silicon a localised zone is formed in the melt containing 15 per cent. of silicon; the eutectic carbon content for such an iron is 0.8 per cent., although the simple solution of the alloying element will only lower the carbon content say from 3.0 to 2.55 per cent. In relation to the equilibrium diagram, therefore, the melt is supersaturated with carbon, and this condition favours precipitation. That this actually does represent the mechanism of the action is shown by the results of analyses taken before and after the addition of ferro-silicon, from which it is seen that the carbon content is always diminished, some carbon floating on the surface of the metal in the form of graphite.

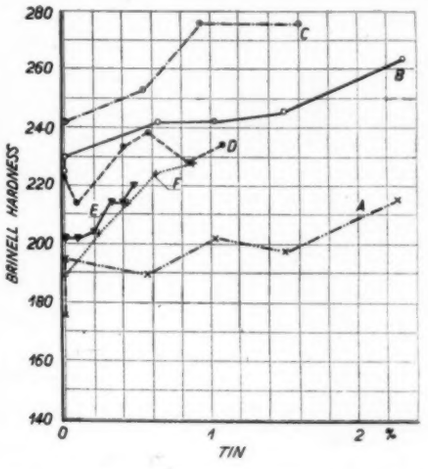


Fig. 7.—Effect of Tin Additions on the Brinell Hardness.

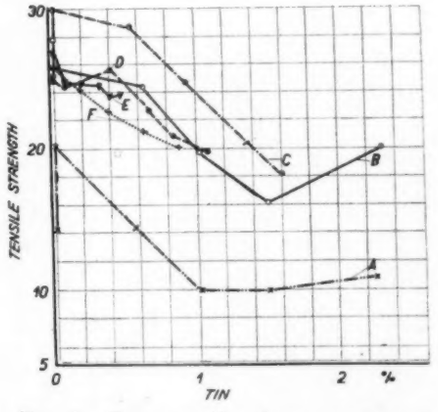


Fig. 8.—Effect of Tin Additions on the Tensile Strength.

In the second place, rates of solution being high, the velocity of precipitation is very rapid and the graphite is precipitated in a fine form. It cannot be claimed in this case that the influence of the graphite nuclei is manifested. It may be noted that on the addition of nickel which also depresses the eutectic point, the same

phenomenon should occur, but it has, in fact, not been observed. One other observation is of interest: the metal cast directly after the addition of ferro-silicon possesses after machining the smell of acetylene (as prepared from calcium carbide), but if after the addition, the melt is allowed to stand at heat for increasing periods

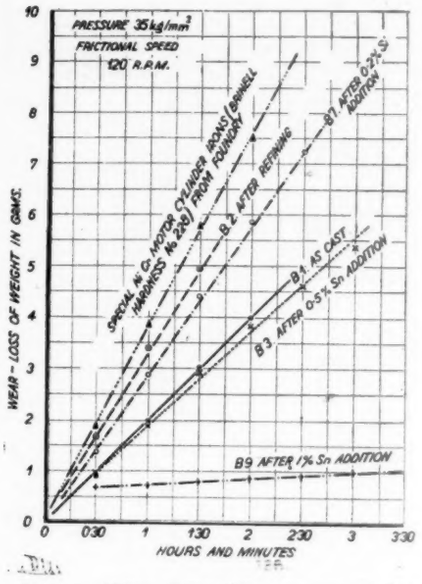

PRESSURE 35 kg/mm²
FRICTIONAL SPEED
120 R.P.M.
SPECIAL Ni Cr MOTOR CYLINDER IRONS (BRINELL HARDNESS No. 220) FROM FOUNDRY
B2 AFTER REFINING
B1 AFTER 0·2% Si ADDITION
B1 AS CAST
B3 AFTER 0·5% Sn ADDITION
B9 AFTER 1% Sn ADDITION
WEAR - LOSS OF WEIGHT IN GRMS.
HOURS AND MINUTES

FIG. 9.—WEAR TEST RESULTS ON AN IRON CAST IMMEDIATELY WITH OR WITHOUT THE ADDITION OF FERRO-SILICON.

prior to casting, then the odour diminishes in accordance with the gradually decreasing effectiveness of the addition.

It is reasonable to suppose that the effect on the physical condition of the iron corresponds to the influence of the calcium which is contained in ferro-silicon and in ferro-molybdenum in large

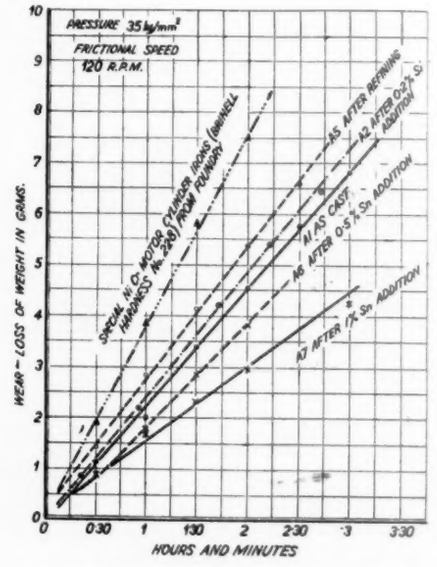

PRESSURE 35 kg/mm²
FRICTIONAL SPEED
120 R.P.M.
SPECIAL Ni Cr MOTOR CYLINDER IRONS (BRINELL HARDNESS No. 220) FROM FOUNDRY
A5 AS AFTER REFINING
A2 AFTER 0·2% Si ADDITION
A1 AS CAST
A6 AFTER 0·5% Sn ADDITION
A7 AFTER 1% Sn ADDITION
WEAR - LOSS OF WEIGHT IN GRMS.
HOURS AND MINUTES

FIG. 10.—WEAR TEST RESULTS ON A TIN-CONTAINING GREY CAST IRON.

quantities. The effect of calcium then would be to modify profoundly the degree of dispersion of the inclusions in the iron.

The study of the possibilities of control of graphitisation by processes analogous to the addition of ferro-silicon or calcium ("Meehanite" is probably a case in point) discloses a large field for experimental research and practical applications.

A particularly rich field would be the study of the control of the physical condition of oxidised iron. During the melting process in the electric furnace or crucible it is only necessary to add hammer-scale to the slag to initiate in the iron after a very short time a strong tendency to chill, and very poor mechanical properties. In contrast to steel, cast iron contains a very low and practically constant oxide content, on account of its physico-chemical equilibrium.

It is necessary then to investigate the influence of the additions on the action of the oxide of iron on the slag, and on the conditions of the elements dispersed in the melt. The improvement in the mechanical properties of such an oxidised iron demands a certain time, and the simultaneous presence of a strongly basic carbon-bearing slag.

TABLE II.—*Mechanical Properties of Irons Containing Tin.*

Test No.	Tin content. Per cent.	Tensile strength. Tons per sq. in.	Transverse test. 30 mm. As-cast.	Transverse test. 25 mm. Machined.	Brinell hardness.	Compression strength. Tons per sq .in.	Wear. Mg. 35 kg. per sq. mm. 7,200 r.p.m.
A 1	0	11.25	39.0		176	68.0	2.275
A 2	0	9.07	35.0		160	57.5	2.425
A 3	0	9.40	35.0		170	62.0	2.750
A 4	0	11.17	39.6		180	64.0	—
A 5	0	12.82	43.0		195	75.5	2.700
A 6	0.56	9.20	38.2		190	69.5	1.900
A 7	1.02	6.35	29.2		202	65.0	1.500
A 8	1.75	6.35	25.3		198	61.0	—
A 9	2.26	6.99	25.2		216	65.0	—
B 1	0	14.72	48.5		225	93.2	2.000
B 2	0	16.35	49.2		214	86.0	3.250
B 3	0	17.02	47.7		218	92.5	3.150
B 4	0	15.49	48.6		214	85.5	—
B 5	0	16.77	49.0		220	91.0	—
B 6	0	15.66	49.8		220	93.0	3.050
B 7	0	16.39	50.4		230	100.0	2.925
B 8	0.63	15.49	43.6		242	98.0	1.875
B 9	1.02	12.57	31.7		242	91.5	0.450
B 10	1.75	10.28	27.2		246	82.5	—
B 11	2.30	12.83	33.0		264	102.0	—
C 1	0	16.95	46.4		242		2.300
C 2	0	18.23	51.2		230		3.600
C 3	0	18.92	49.6		239		3.350
C 4	0	18.03	49.4		242		—
C 5	0	18.80	50.1		242		—
C 6	0	19.00	49.6		242		2.775
C 7	0	16.00	—		242		2.700
C 8	0.54	18.23	42.5		253		22.500*
C 9	0.93	15.67	41.9		276		1.450
C 10	1.60	11.56	31.2		276		—
D 1	0	15.81		46.5	223	97.3	
D 2	0.08	15.45		46.5	214	92.8	
D 3	0.40	16.2		—	234	100.1	
D 4	0.57	14.35		—	238	100.1	
D 5	0.84	13.27		40.1	228	97.4	
D 6	1.08	12.57		—	234	91.0	
E 1	0	17.03	45.8		202	92.6	
E 2	0.09	15.62	41.0		202	89.4	
E 3	0.20	15.55	39.5		204	92.6	
E 4	0.32	15.50	37.9		214	94.8	
E 5	0.40	14.97	34.7		214	94.5	
E 6	0.47	15.18	31.4		220	98.6	
F 1	0	14.37	36.8	48.9	189	90.1	
F 2	0.19	15.37	40.0	45.1	204	91.6	
F 3	0.39	14.35	38.9	38.1	214	95.4	
F 4	0.62	13.47	35.1	35.2	224	95.4	
F 5	0.87	12.78	31.3	28.3	228	96.0	

* We see no reason for this excessively high figure, and suggest it should be 2.50.—Editor.

Tin Additions

Another addition which is little known and rarely used is tin. Figs. 7 and 8 and Tables I and II show the variations of properties of irons on the addition of this metal. It will be seen that a small addition of tin produces a slight graphitisation, particularly in hypereutectic irons or those oxidised by additions of ore.

The influence of small additions of tin on graphitisation is to modify the physical condition of the iron and the mechanical properties of the matrix, which is hardened and strengthened but simultaneously embrittled.

Apart from these effects (on the whole, unfavourable) of tin, the addition of tin up to 1 to 2 per cent. increases hardness by about 2 deg. Brinell more than the addition of 1.4 per cent. nickel and 0.35 per cent. chromium. The decreased tensile strength and resistance to bending should not prevent the use of this iron where high hardness and, particularly, high resistance to wear are desired. Alloying and homogeneisation take place much more readily than in the case of nickel and chromium, and the use of tin in the foundry is recommended where toughness is not a primary consideration. The authors have shown the wear-resistance of tin-bearing irons by a method similar to that of R. Knittel. A cast rod 100 mm. in diameter was fixed in the head of a drilling machine and bearing up against this under a load of 35 kg. per sq. mm. was a piece of the same metal 25 mm. in diameter running at 120 r.p.m. Knittel employed a pressure of 24 kg. per sq. mm. at 325 r.p.m., and found after 3,250 revolutions a mean wear value of 900 mg. Under the conditions maintained in the authors' experiments, and assuming wear to be proportional to the speed of rotation and to the pressure, this is equivalent to 2,900 mg. per hr. For various irons, without the addition of tin, a wear value of 2,200 to 3,600 mg. per hr. was found

CLEAN IRON
SAVES COKE IN THE CUPOLA

The cleaner iron given by Workington Machine Cast Pig (free from sand fused to the surface) saves fuel in the cupola. A foundry which used Machine Cast Pig reports the following results:

- Coke consumption decreased by 20%
- Slag from the cupola reduced by 45%
- Limestone charged reduced by 50%
- Quantity of iron melted increased by 24%
- Hanging eliminated completely.
- Castings cleaner.
- Metal composition more regular.
- Longer Life of Cupola Lining.

THE UNITED STEEL COMPANIES LTD

Write to The Publicity Department, The United Steel Companies Ltd., 17, Westbourne Road, Sheffield, 10, for Brochure "Machine Cast Pig Iron."

WORKINGTON
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WORKINGTON IRON & STEEL COMPANY · WORKINGTON · CUMBERLAND

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W.33

by the authors, and the mean value, 2,900 mg., is in agreement with Knittel's figure.

Figs. 9, 10, and 11, illustrate the results obtained on three series of cast irons:—(1) Cast immediately, with or without the addition of ferro-silicon; (2) cast after being held at heat for a given period, and (3) after the addition of tin. As a means of comparison, results are also given for a standard nickel-chromium iron employed for automobile cylinder blocks. It will

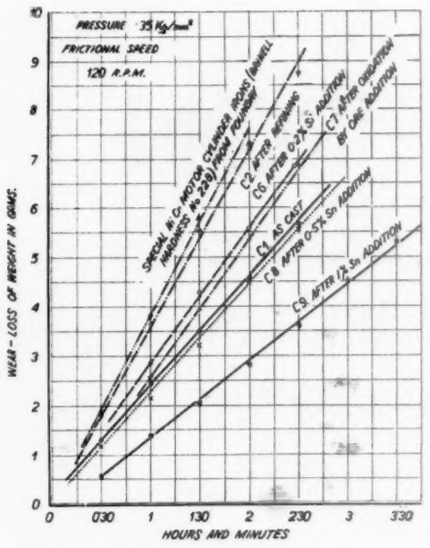
PRESSURE 35 Kg/cm²
FRICTIONAL SPEED
120 R.P.M.
SPECIAL Ni Cr MOTOR CYLINDER IRONS (BRINELL HARDNESS IN 24h) FROM FOUNDRY
C2 AFTER REMAKING
C5 AFTER 0·2% Sn ADDITION
C7 AFTER OXIDATION BY ORE ADDITION
C1 AS CAST
C8 AFTER 0·5% Sn ADDITION
C9 AFTER 1% Sn ADDITION
WEAR - LOSS OF WEIGHT IN GRMS.
HOURS AND MINUTES

FIG. 11.—WEAR TEST RESULTS OF AN IRON HELD AT HEAT TEMPERATURE FOR A GIVEN PERIOD.

be seen that the addition of tin confers increased wear resistance with no corresponding increase in hardness. The addition of 1.0 per cent. of tin decreased wear to such an extent that results became irregular and virtually no wear occurred.

In Fig. 12 the wear of a series of irons is presented as a function of the method of casting, condition of the iron, and of the added tin.

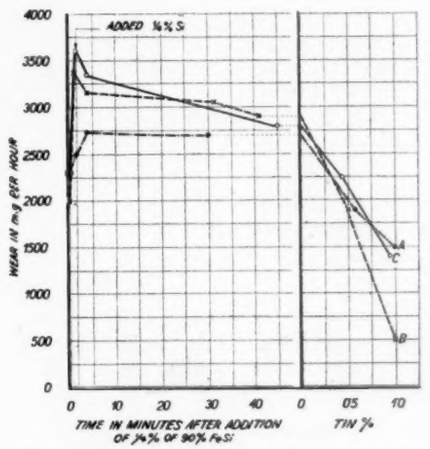

FIG. 12.—WEAR RESISTANCE RELATED TO THE METHOD OF CASTING.

It is apparently to be concluded that the effect of tin in diminishing wear is considerably greater than that of other additions within the range where a hardness and structure permitting easy machining are to be preserved.

An explanation of its action may be that tin exercises a chemical action on the superficial oxidation processes associated with wear, and confers special mechanical properties on the matrix.

Catalogues Received

Chrome Spinel. General Refractories, Limited, of Sheffield, and elsewhere have used a particularly well-produced brochure in which to tell of the developments and use of Spinella and Saxpyre bricks, the basis of which is chrome-spinel. To the reviewer this makes very interesting reading, because when he had charge of basic furnaces, he failed to notice any real advantage to accrue from interposing neutral chrome bricks between acid and basic refractories. Sometimes acid material built straight on top of basic gave excellent results because the construction he adopted reduced pressure to a minimum. Of course, in large furnaces this became increasingly difficult. To return to the booklet, after a general introduction much technical data are given of these bricks.

Saxpyre bricks, for instance, have the interesting composition of MgO = 35; Cr_2O_3, 25; Al_2O_3, 17; FeO, 14, and SiO_2, 7 per cent. We see that the word "refractability" is erroneously used instead of "refractoriness," the former word belonging to the domain of optics and not heat-resisting material. Such lapses make for confusion. The *refractoriness* under load of 50 lbs. per sq. in. is for final collapse of the order 1,690 deg. C. We confess to being unable to visualise what the spalling resistance index really means, but in this case it is 5 cycles. Such bricks are recommended (supported by testimonials in some cases) for basic open-hearth furnaces, soaking pits, reheating, and basic electric furnaces, for the hearths, and walls, in the case of melting furnaces as far as the slag line. Very wisely, notes on the practical handling of these bricks has been included. Apparently Spinella bricks are a later development and are used above the slag line for walls, blocks, jambs and other parts. On page 9 it is stated that "At present there are divergent views on the advantages of basic roofs for open-hearth furnaces. Spinella bricks have, however, proved their suitability for this purpose." Yet overleaf a very smart, coloured, doublespread plan and elevation of the arrangement of Saxpyre and Spinella bricks in a basic open-hearth furnace, show the roof to be carried out in silicas. As an old steelmaker, the reviewer endorses leaving the question open for the practical operator to solve. "Gang warily" is a good motto, for improvements must be a gradual evolution.

Compared with Saxpyre, Spinella bricks carry 4 per cent. more magnesia and 1 per cent. less chrome and alumina, a similar quantity of iron oxide and 2 per cent. less silicon. The refractory properties are slightly better, but this spalling index instead of being 5 now reads more than 30 cycles. This seems good as spalling is the major trouble in roof maintenance. The illustrations shown, however, tend to emphasise straight refractoriness and are extremely interesting Once again we commend the wisdom of giving such obviously sensible practical notes on actual brick setting. The brochure, which the reviewer has obviously found interesting, concludes with notes on manufacturing plants of the issuing house and information as to the location of their works and offices. The brochure is available to our readers on request.

Electric Welding. A leaflet received from Runbaken Electrical Products, of 280, Deansgate, Manchester, 3, illustrates and describes a low-priced electric arc welder. It has been designed for the garage and light engineering trades, but is no doubt of some considerable interest for the jobbing foundry owner. It weighs only 97½ lbs. and thus is readily portable.

STEWARTS AND LLOYDS, LIMITED, Glasgow, have received a contract from the Buenos Ayres Great Southern Railway for 3,500 black steel boiler tubes and 950 black steel super-heater smoke tubes.

Book Review

Wages and Labour Conditions in British Engineering. By M. L. Yates. Published by Macdonald & Evans, 8, John Street, Bedford Row, London, W.C.1. Price 6s. net.

An understanding of the labour situation is becoming an increasingly necessary part of the equipment of all those responsible in any degree for the management of our industrial undertakings, and this volume, which is mainly a study of the wage conditions of the various trades which together form what we designate the engineering industry, provides an excellent background on which such an understanding can be based. As the author points out in his preface, he has confined himself to a purely factual treatment of his subject.

A most provocative, though apparently indisputable point emphasised by Mr. Yates, is that the wage status of the skilled, as compared with the semi-skilled and unskilled workers, has declined since 1914. This fact is worthy of very serious consideration by all concerned.

Mr. Yates attempts no theories, yet the facts connected with the constituents of the industry, the developments in employer and worker organisations, and the effect of general circumstances during the past fifty years, all as contributing to the present wage and labour conditions, are presented in such a manner as to make most interesting reading, and to convince the reader that the author is writing from first-hand knowledge. This is a valuable contribution on an important subject.

C. W. B.

Welding Exhibition

(*Concluded from page 227.*)

WELDING PLANT.

(STAND NO. 14 B.)

Welding Supplies, Limited, Anchor and Hope Lane, Charlton, London, S.E.7, are showing a series of three sizes of motor-generator welding plant of unusually compact and portable design, having output ranges of 20-200, 30-250 and 40-400 ampéres. There are also various sizes of

TYPE K.U. 350 MOTOR GENERATOR WELDING PLANT, BY WELDING SUPPLIES, LIMITED.

single-operator welding transformers, and the firm has installed a welding booth in which plant and electrodes for welding all types of material can be demonstrated.

Various test-pieces and specimen welds are shown in steel, cast iron, bronze, Monel Metal, stainless steel, etc. Another interesting exhibit is a new automatic welding head capable of feeding continuously commercial-coated electrodes, bare wire or carbons.

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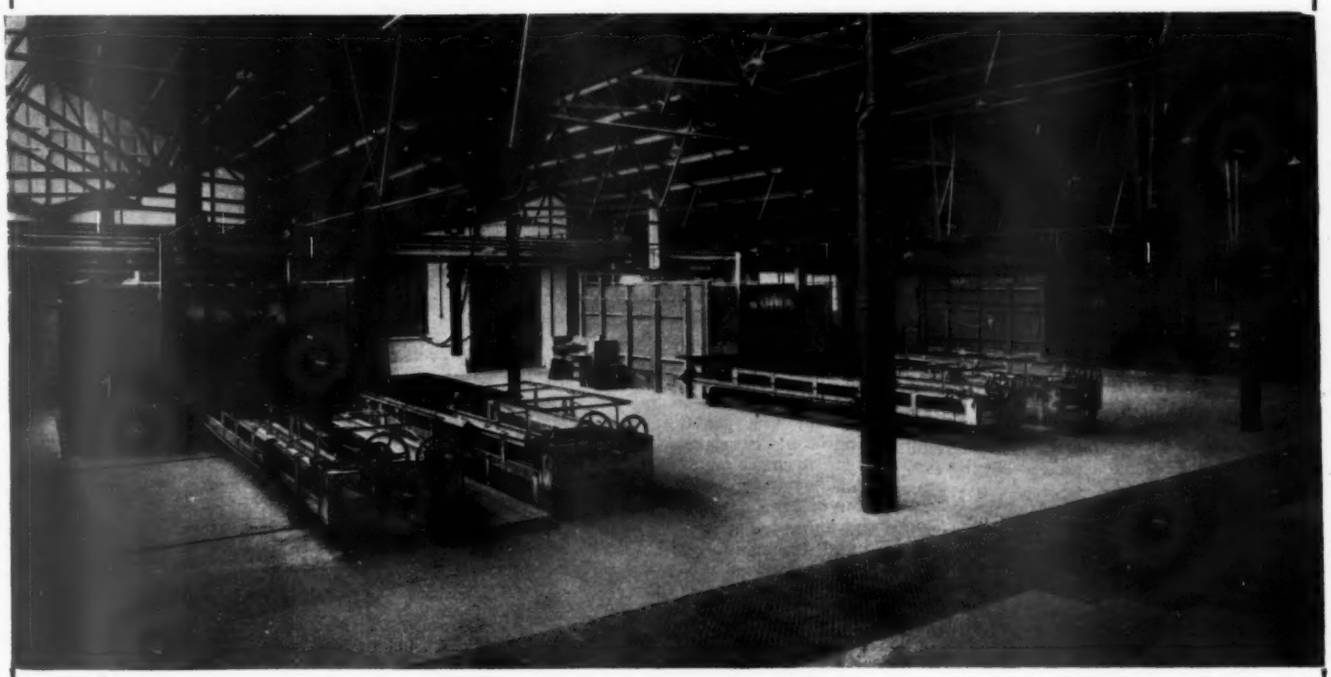

The Illustration shows a Battery of Gibbons Muffle Enamelling Furnaces installed at the works of R. & A. Main Ltd., Upper Edmonton, London, N.18.

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Designing Castings to Develop Strength Properties*

By PROF. L. F. C. GIRARDET

The calculation of the strength of machine components cannot be based exclusively on the results obtained from static test-pieces. It is essential to take into consideration strength properties which are innate in the actual shape of the components. This has been clearly shown by the author.

The question therefore arises as to how to give to castings the best shape for incorporating the full value obtainable from the particular metal or alloy used. In order to do this it is necessary to take into consideration the anisotropism of castings, which are stronger in the thin rapidly-cooled sections than in the thick slowly-cooled portions. It is therefore essential to avoid useless masses of metal, which only lower the quality. The contraction due to solidification must not be hindered, otherwise cracks and internal stresses will ensue. Due to his skill, the craftsman can, in spite of everything, successfully make such castings, but their intrinsic qualities are bound to suffer; in such cases the originators of poor designs should, in justice, take the consequence.

In places where there are changes of direction or the density of the flow of the forces, overstressing (or fatigue) of the metal must be avoided by progressively directing this flow through an appropriate opening, which in itself must be progressive. The notch effect shows up in a more pronounced manner as the quality of the metal improves, to such an extent that it may completely neutralise the effect of quality-improvement. It is therefore essential to reduce notch effect as much as possible in the design, by making use of the skin effect. To this end, the foundry should receive a sketch showing subsequent operations, such as details of the teeth in cut gears; holes to be enlarged by drilling or tapping, etc. Each notch would, under such conditions, be faced with an appropriate structure. In general, a design must be forthcoming in which parts subject to fatigue will be situated in areas containing the most suitable structure.

For studying structures experimentally, up to now only the appearance of fractures has been available. By macrographic deep etching, however, the tests will show up the grain boundaries, which are along the meshes of the system and formed of substances expelled to their periphery. Both the grain and the size and shape of the system are thus defined. When etching important surfaces, the relationship of various areas is disclosed. The author has used surfaces taken from interesting portions, polishing down to 00, using an abrasive belt machine, and etching them electrolytically. Surfaces so obtained are dried, fixed and then photographed by an appropriate apparatus. In the Paper some examples, especially of gear wheels, are given. The author has reviewed the experiments of Dr. Thum on the fatigue of iron castings and ended by postulating five practical rules to apply to the design of cast-iron engine components.

These five rules are:—

(1) Each component should first of all be "idealised" and transformed into an assembly of lines following which the flow of forces flow. It is necessary to calculate the intensity of flow following each line, then to take it as the axis of a solid with a section corresponding to the strength of the material.

(2) At the junction or the crossing of certain lines, there is a change of direction, or maybe an increase in the strength of flow, which does not divide itself regularly throughout the section. A mental picture of this distribution is made by imagining the component is made of india-rubber and envisaging to the best of one's ability the deformation which would take place under conditions of use. The necessary conformation must be given to junctions in order that the deviation of the flow will be as progressive as possible, and in dangerous places the section will be increased.

(3) It is now desirable to take into consideration the properties of the material which show

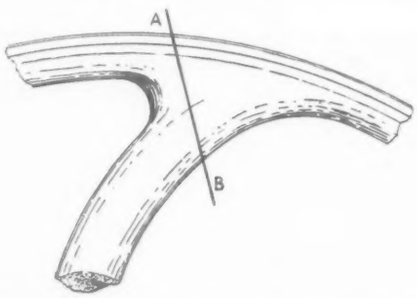

FIG. 1.—SECTION OF A SMALL PULLEY SHOWING SUDDEN CHANGE OF SECTION.

up when working from a particular design. As a basis for calculation a figure can be taken which should represent the fatigue strength under conditions of use, generally the tensile or shear strength. Experience has shown that the fatigue strength (or endurance) varies from 0.40 to 0.60 of the tensile strength, and a suitable factor of safety coefficient will be chosen. Cast iron, however, is not isotropic; its tenacity is reduced in massive sections and is increased in thin ones. It is thus necessary to eliminate large

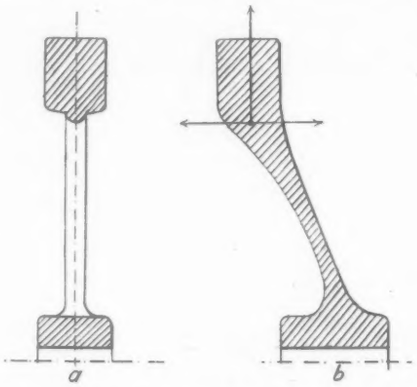

FIG. 2.—INFERIOR AND IMPROVED METHODS OF JOINING THE RIM OF A PULLEY TO THE CENTRE.

masses of metal and to introduce as far as possible isothermic conditions of cooling, so as to ensure a homogeneous metal.

(4) It must not be forgotten that notch effect shows up more acutely in high-quality metal. If the use of high-duty iron is envisaged, it is necessary to take this factor into consideration, or else the benefits sought will be lost. To carry out this, notched parts must be eliminated as far as possible, by utilising the skin effect in order to obtain a reinforcement of the structure around the notch, making it leave the foundry in such a condition as to be free from subsequent machining. It is necessary to produce a sound, smooth skin or, at worst, one requiring but a very light machining at places where tensions are likely to be at a maximum. Thus acute angles at all notched junctions must be avoided and such places be rounded off by fillets. In simple cases an endeavour has been made to ascertain the best curvatures to give to these fillets, but the results given do not seem capable of being generally applied. Besides the external notch effect, which can be overcome by filleting, there is the internal aspect. This introduces heterogeneity of structure, graphite inclusions, diverse carbides, etc., the number and size of which are influenced by the shape of the notch. The conformation of the fillet suitable for any given iron and shape and size of casting, will not necessarily serve under different circumstances, since the internal texture will not be the same, even though the same iron be used. Only a shape based on preference can be postulated!

(5) Thus, wherever possible, one should see that the most highly stressed area is placed in a favourable condition through controlling the cooling process. In order to understand clearly this premise, recourse will be had to a simple example—the making of an engine flywheel. In actual operation this component varies constantly in speed and is subjected to alternating stresses. If the flywheel is of classical shape, it consists of a rim connected by spokes which unite at the boss. When the speed varies, the stress concentrates at the junction of the rim and the spokes, actually a weak point, and one quite liable to contain internal cracks and possessing an unsuitable structure. Though Fig. 1 really refers to a small pulley, it will serve to show what happens in a small thin-sectioned passage leading to a different section. This will be intensified in the case of a flywheel of heavy section. There will be dangerous stresses at this point, which explains why flywheel breakages, attributed to overloading, racing, etc., are really due to fatigue cracks at the spoke junctions. Supposing that the usual method of connecting the rim and the centre is discarded and the two parts are connected as shown in Fig. 2, speed variations of the flywheel now tend to shear the connection with the rim—just as previously with the spokes—but now to increase the diameter of the base of the cone. There will be the decomposition of the destructive stresses, for in place of changing abruptly from the spoke to the rim, a progressive transition is allowed for, as shown in Fig. 2*b*. This shows that the dangerous stresses are gathered together as a weak aggregate and are spread over a large section. Moreover, this section is beneficiated from the point of view of cooling, and will carry the best form of structure. Thus, a design has been created which, whilst having the power to resist fatigue, also induces an improved structure.

* Abstract of a Paper presented to the Paris Foundry Congress.

Stoppages in Light Castings Industry

Unofficial strikes of workers engaged in the light castings industry have been the subject of correspondence between the Employers' Federation and the Workers' Union, particulars of which appear in the half-yearly report of the Ironfounding Workers' Association, just issued. A letter was received from the National Light Castings Ironfounders' Federation complaining that members of the Ironfounding Workers' Association were showing a complete disregard of arrangements between the Federation and the Association for the regulation of industrial disputes. In reply, the Association's secretary wrote that his executive deprecated the action of men striking work without notice. The executive, after considering the matter, issued a circular to all their shop delegates drawing their attention to these stoppages of work, and informing them that they must take the course indicated by the Association rules.

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IRON or STEEL

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WE CAN SUPPLY ANY SPECIAL GRADE or COLOUR TO MEET YOUR REQUIREMENTS . . . .

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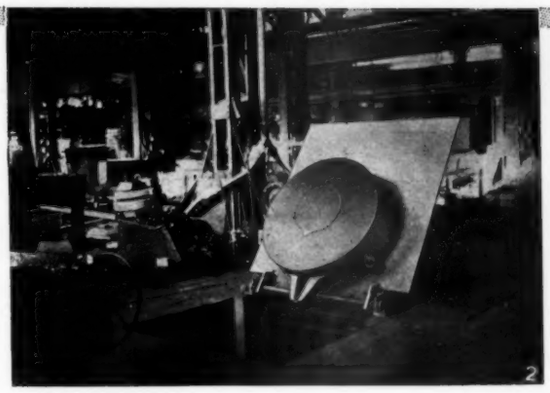

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- *Warner C.B.R.*
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  (FOR CYLINDERS, ROLLS, ENGINEERING CASTINGS, ETC.)
- *Low Carbon Malleable*
  (FOR MALLEABLE CASTINGS OF ALL DESCRIPTIONS)

Supplied to any specification between limits of 2·00 and 3·50% Carbon and ·50% and 3·50% Silicon

ACTUAL ANALYSIS CERTIFICATES ARE AVAILABLE WITH EACH DELIVERY

Typical Cylinder Pig Iron Specification

TOTAL CARBON	2·70%
SILICON	1·80%
MANGANESE	·90%
SULPHUR	·06%
PHOSPHORUS	·40%

Typical Malleable Pig Iron Specification

TOTAL CARBON	2·60%
SILICON	·75%
MANGANESE	·50%
SULPHUR	·05%
PHOSPHORUS	·06%

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The Week's News in Brief

Trade Talk

ABOUT 3,600 ENGINEERING APPRENTICES are on strike in the Manchester area, and are seeking an increase in wages of 3s. a week.

THE LION FOUNDRY COMPANY, LIMITED, Kirkintilloch, have acquired the garages of Lawsons, Limited, omnibus proprietors, for extension purposes.

GLENFIELD & KENNEDY, LIMITED'S OFFER to supply, free of charge, wave-making machinery for the proposed public swimming baths in Kilmarnock has been accepted by the Town Council.

J. L. THOMPSON & SONS, LIMITED, Sunderland, have received an order from Hall Bros., of Newcastle, for a 9,100-ton steamer. Engines will be supplied by the North-Eastern Marine Engineering Company, Limited, Wallsend.

AS A PRELIMINARY to the opening of negotiations in the dispute at the works of W. & J. Lawley, Limited, Britannia Foundry, West Bromwich, the 100 employees who had been out on strike decided to return to work.

THE ANNUAL DINNER of the Institution of Mechanical Engineers will be held at the Connaught Rooms, Great Queen Street, London, W.C.2, on Friday, October 15. Applications to attend should reach the Secretary at Storey's Gate, St. James's Park, London, S.W.1, before October 6.

IT IS REPORTED that negotiations have now been completed for the sale by Thos. W. Ward, Limited, Sheffield, of the Langloan works at Coatbridge to a new industrial syndicate. The works, formerly operated by Langloan Iron & Chemical Company, Limited, have been idle since 1920. They consist of five blast furnaces.

HIGHER WAGES are being paid to all employees over 21 years of age at the works of the Staveley Coal & Iron Company, Limited, the increase being at the rate of 3d. per day. The company is also recognising the principle of an annual holiday with pay and is setting aside for each employee a further sum equivalent to 2 per cent. of wages, based on a 47-hour week, for each employee to draw when going on holiday each year. These concessions apply to the works of the company.

Contracts Open

Brigg, September 20. — 233 yds. of 4-in. and 223 yds. of 3-in. cast-iron water mains, for the Urban District Council. Mr. N. D. Preston, engineer, Council Offices, Town Hall, Brigg.

Colne Engaine, September 30.—Provision and laying of 750 yds. of 3-in. cast-iron mains and fittings, for the Halstead Rural District Council. Mr. G. F. Dearman, surveyor, Council Offices, Halstead, Essex.

Patent Specifications Accepted

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

470,330. SADLER, A. (Electric Furnace Company). Method of, and apparatus for, the heat-treatment of metals.

470,379. CORHART REFRACTORIES COMPANY. Cores for moulds in which refractory materials are cast.

470,574. AKT.-GES. DER EISEN- UND STAHLWERKE VORM. G. FISCHER. Pipe fittings.

470,682. RENAULT, L. Furnaces for heat-treatment in a gaseous atmosphere.

470,701. TRIGGS, W. W. (American Gas Furnace Company). Process and apparatus for case-hardening articles of iron, steel, or alloys thereof.

470,766. WAKELIN, A. J. Casting of metals and alloys.

Personal

MR. JAMES MACDONALD has been appointed technical director of G.W.B. Electric Furnaces, Limited, Belgrave Street, London. He joined the firm three years ago, being appointed chief designer last year.

MR. J. W. HARTLEY, chairman of Hartley's (Stoke-on-Trent), Limited, general engineers and ironfounders, celebrated his 92nd birthday last Thursday. He is a Past-President of the Stoke-on-Trent Association of Engineers.

COLONEL FREDERICK AUSTIN NEILL, chairman and managing director of James Neill & Company (Sheffield), Limited, Composite Steelworks, Sheffield, who will be installed as Master Cutler at Sheffield on October 7, is the eldest surviving son of the late Mr. James Neill, the founder of the company, who was Master Cutler in 1923. Colonel Neill was born in Sheffield in 1891, and was educated at Wrekin College before going to Germany for two years to complete his education and obtain business experience. In 1910 he entered the business of James Neill & Company (Sheffield), Limited. He was appointed a director in 1916, and on the death of his father in 1930 became chairman and managing director of the company. He has travelled extensively on the company's business, visiting practically all the European markets. Colonel Neill has been a member of the Sheffield District Committee of the Federation of British Industries since 1927, and since 1931 has been one of the Sheffield representatives on the Empire and other committees in London, being elected to the Grand Council Executive in 1933. He has been a member of the Sheffield Chamber of Commerce Council since April, 1925, and is also President of two Associations affiliated to the Sheffield and District Lighter Trades Association.

Obituary

MR. HORACE WOLVERSON, a director of H. & J. Hill, Limited, Etna and Russell Ironfoundries, Willenhall, died suddenly whilst driving a car last week, at the age of 42.

MR. THOMAS WILKINSON WILLIS, a director of Sanderson Bros. & Newbould, Limited, crucible steel manufacturers and founders, Sheffield, died last week. He had been associated with the steel trade throughout the whole of his working life. In his early years he was with Sanderson Bros. & Newbould, and from them he went to Joseph Ashforth & Company. Then he joined Thos. Firth & Company, Limited, being active in the establishment of that firm's works at Tinsley. He was works manager there for about 20 years. In 1911 he returned to Sanderson Bros. & Newbould and was appointed works director, a position he held until 1930, when he ceased his executive activity, but retained his seat on the board of directors and acted as consultant. Mr. Willis had much to do with the Sheffield Trades Technical Societies movement, and was the first President of the Tool Trades Technical Societies. From 1931 to the time of his death he was President of the Sheffield Lighter Trades Employers' Association, President of the Saw Manufacturers' Association from 1918 until 1935, and President of the High Speed Steel Hacksaw Trade Association from its founding in 1929 onward.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal" :—

"NEW HERALD."—Stoves, grates and ranges. R. Russell & Sons, Limited, Peel Foundry, Meadow Road, Derby.

"BRIVADIUM."—Metal linings for cylinders and brake drums. British Piston Ring Company, Limited, Holbrook Lane, Coventry.

"BRIMOL."—Cylinder linings of ordinary metal. British Piston Ring Company, Limited, Holbrook Lane, Coventry.

Company Meeting

Allied Ironfounders (Ireland), Limited

The directors' report presented at the first annual general meeting of Allied Ironfounders (Ireland), Limited, at Waterford, stated that in view of the fact that full production had not yet been reached and of the difficulties of training unskilled local labour, they had decided to write off £5,172 to deferred revenue account, leaving a balance of £4,285 to be carried forward to debit of profit and loss account. Through their association with Allied Ironfounders (England), Limited, and Izons, Limited, the chairman said they had available a good range of modern patterns which would otherwise have taken years to produce. They were approaching a time when much bigger production would be possible and there was no doubt the industry would be a success.

Company Reports

British Insulated Cables, Limited. — Interim dividend of 5 per cent.

Craven Bros. (Manchester), Limited. — Interim dividend of 5 per cent.

R. & W. Hawthorn, Leslie & Company, Limited.— Dividend of 9 per cent. for the year ended June 30 last.

Vulcan Foundry, Limited. — Dividend on the ordinary shares of 2½ per cent. for the year ended June 30.

English Electric Company, Limited.—Dividend on the 6½ per cent. cumulative preference stock in respect of the half-year ended June 30.

Ley's Foundries & Engineering, Limited.—Dividend on the 5 per cent. cumulative preference stock for the half-year ending September 30.

Lancashire Steel Corporation, Limited.—Dividend on the 5 per cent. cumulative redeemable first preference shares for the six months ending October 31.

Worthington-Simpson, Limited.—Interim dividend of 3 per cent. in respect of half-year ended June 30, on the cumulative preference shares.

Stothert & Pitt, Limited.—Dividend of 10 per cent. and a cash bonus of 2½ per cent. on the ordinary shares for the year ended June 30. Profit for the year was £65,218.

Alliance Aluminium Holdings, Limited.—Profit for year to June 30, after debenture interest and other charges, £2,430; brought in, £3,390; carried forward, £5,820.

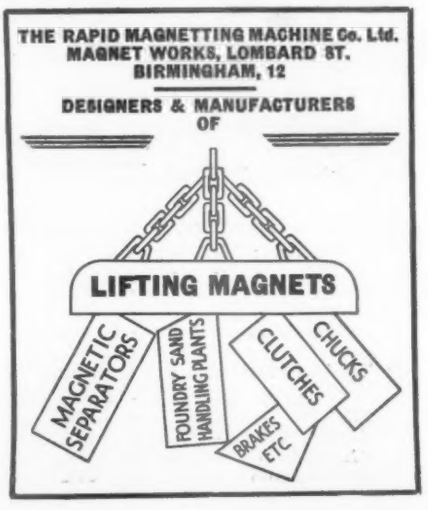
Forthcoming Events

Until SEPTEMBER 17.

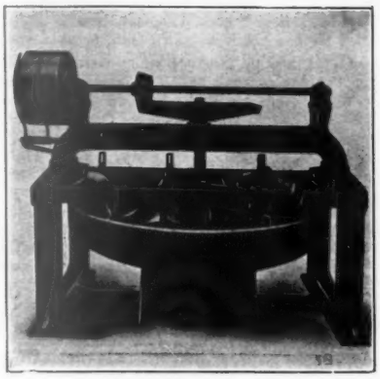
Iron and Steel Institute :—Autumn Meeting in Middlesbrough.

SEPTEMBER 16 TO OCTOBER 2.

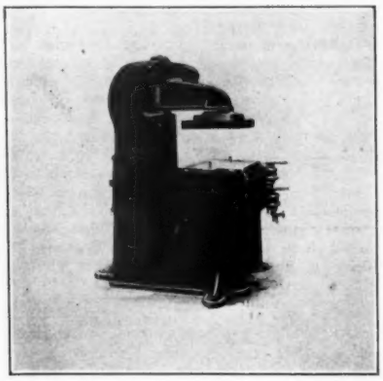
Engineering and Marine Exhibition :—Incorporating the Foundry Trades' Exhibition and the Welding Exhibition, at Olympia, London, W.14.



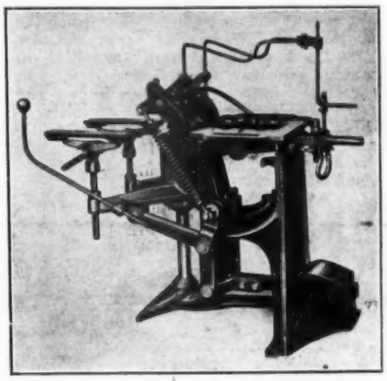
LATEST ENCLOSED SAND PROTECTED MOULDING MACHINES



Scroll Roller Sand Treating Mill (Gernelle-Danloy Patents).
These milling rollers or scrolls turn sand at the rate of 1,200 times per minute. Resultant mixing and milling effect unapproached by any other system.



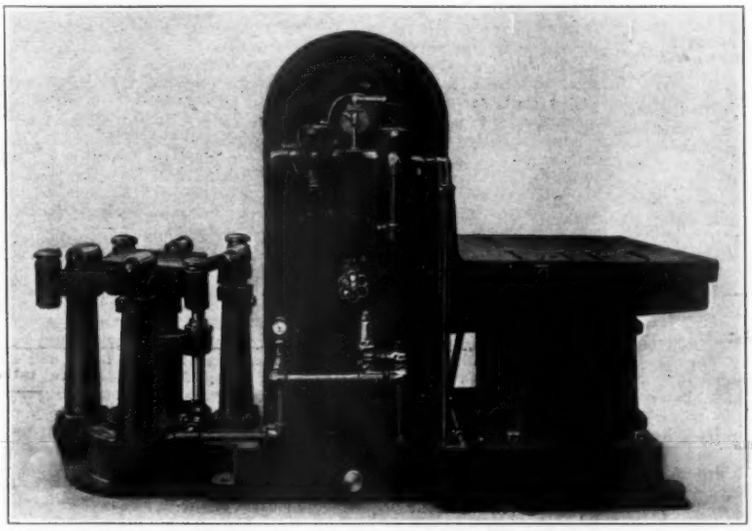
Latest Enclosed Sand Protected Jolt Squeeze Straight Lift Machine.
Made in a range of sizes.
Pattern Draw—Air on oil.



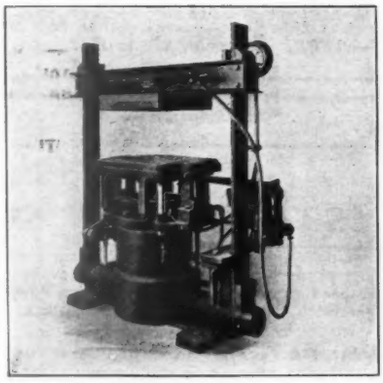
Hinge Type Hand or Power Jolt Ram Rollover Pattern Draw Machine.
For making Cores or Small Moulds.
Load Capacity on Table .. 200 lbs.
Pattern Draw 8". Boxes up to 24" × 16" × 12".

LATEST ENCLOSED SAND PROTECTED MODEL
"SHOCKLESS" JOLT RAM ROLLOVER PATTERN DRAW MACHINE

NOTE
MECHANICAL SIMPLICITY
SAND GUARDING
ACCURACY & STEADINESS OF DRAW
(AIR ON OIL)



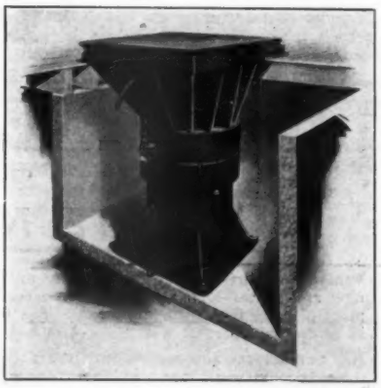
NOTE
CLEANNESS OF DESIGN
EASE OF CONTROL
SMOOTHNESS OF ROLLOVER
(AIR ON OIL)



Power Squeezing "Split" Pattern Moulding Machine.

MADE IN A RANGE OF SIZES

SPECIAL
TIME SAVING EQUIPMENT
INCLUDES
INSTANTANEOUS POWER
OPERATED CLAMPS
GRAVITY ROLLER DISCHARGE



"Shockless" Jolt Ram Moulding Machine.
Made in a range of sizes, to take loads up to 35,000 lbs. at 80 lbs. air pressure.

MACNAB & Co., Ltd., 150, Holborn, London, E.C.1

Raw Material Markets

It is unlikely that there will be any opportunity for consumers to make contracts for additional supplies of pig-iron for a considerable time, as production generally is accounted for over the ensuing six months. While the heavy delivery arrears remain, makers are naturally unwilling to add to their order-books. On the whole, imports of foreign ore are sufficient for current needs. The first cargo from Bilbao since the fall of the port has arrived in the Tees, and it is hoped that further imports from North Spain will be possible. The high level of freights is hampering negotiations for new ore contracts.

Pig-Iron

MIDDLESBROUGH.—After the steelmakers' requirements have been met, there is little pig-iron left for distribution to other users, and all deliveries are having to be carefully rationed. It is usually possible to renew expiring contracts, but other new business is out of the question. No. 3 Cleveland G.M.B. is quoted at 101s., No. 1 foundry 103s. 6d., and No. 4 foundry and No. 4 forge at 100s. per ton, delivered in the Middlesbrough district. Complaints of the shortage of hematite are not so frequent, and deliveries recently have improved as a result of the increase in production. Nevertheless, there is still a heavy export inquiry, which could be dealt with were the necessary supply available, and the prices for this business would be far more remunerative than home trade. East Coast mixed numbers are quoted at 122s. 6d. on the North-East Coast, 123s. in Scotland, 128s. in Sheffield, and 133s. 6d. in Birmingham.

LANCASHIRE.—The pig-iron situation in this area remains very tight, and the demand considerably outstrips the available supply. Consuming plants have booked orders extending, in many cases, over the next two years, and so there is little possibility of any reduction in the demand for pig-iron during this period at least. A small amount of business is being done in American foundry iron at 145s. to 150s. per ton, delivered in the Lancashire area. Derbyshire and Staffordshire brands of No. 3 foundry iron are quoted at 109s., with Northamptonshire at 107s. 6d. and Derbyshire forge iron at from 104s. to 106s. Deliveries of hematite are still restricted. West Coast brands are nominal at 131s. for delivery equal to Manchester, and East Coast at 130s. 6d., while Scottish No. 3 foundry ranges from 137s. 6d. to 140s., delivered.

MIDLANDS.—Pig-iron deliveries have been on a slightly better scale recently, largely due to the lesser activity at the light-castings foundries. This is likely to be merely a temporary phase, however, and increased demands are expected to mature in the autumn. There is no change in prices, Northants No. 3 being quoted at 103s. 6d., and Derbyshire, Lincolnshire and North Staffordshire at 106s., delivered to Birmingham and Black Country stations. Special irons continue to be well inquired for and supplies are being taken up in larger tonnages. There is a lull in business for Continental and American iron. The full output of hematite is under contract up to the end of the year and no business is possible which involves deliveries after December 31. For delivery to Midland stations, East Coast No. 3 is quoted at £6 13s. 6d., with West Coast mixed numbers at 1s. per ton more. An additional 1s. 6d. per ton is charged for delivery into works.

SCOTLAND.—Generally, current deliveries of pig-iron are sufficient to allow works to maintain a satisfactory rate of working, but some inconvenience is being caused at times. No. 1 foundry is quoted at 115s. 6d. and No. 3 at 113s. 6d., f.o.t. furnaces. There is no Cleveland iron on offer and the prices are nominal at 104s. at Falkirk and 107s. at Glasgow. The hematite and basic situation is a little easier and a heavy cargo of basic from India has arrived in Glasgow. For delivery to local steelworks quotations are unchanged at 123s. for hematite mixed numbers, 107s. 6d. for Scottish basic, and 100s. for English and Indian basic, all less 5s. rebate.

Coke

Those collieries which have intimated their willingness to enter into business for the first half of next year have disposed of heavy tonnages at prices well in advance of the current quotations. For delivery to Birmingham and district, the minimum price of foundry coke is 51s. 6d., while the maximum is as much as 69s. per ton.

Steel

Busy conditions rule in the steel market, and the demand is only held in check by the difficulty of finding suppliers able to accept orders for the required delivery, says the official report of the London Iron and Steel Exchange. This situation has prevailed for some time, and, although in one or two departments it is reported that the position is becoming slightly easier, in general trading in the market is still governed by a severe stringency in supplies. The position in the semi-finished steel market is rather easier than for some time, although operations at some of the consuming works are still affected by the shortage of material. Increased quantities of Continental steel are being received, and these, with the production of the British works, should lead to improved conditions. The production of finished steel material continues upon a heavy scale, but it is insufficient to meet consumers' requirements. Many of the steelworks have practically sold their production until the end of the first quarter of next year; and others will enter 1938 with a heavy tonnage of orders on their books.

Scrap

Imports of scrap continue to increase and the average declared c.i.f. value of imported scrap in July was in excess of £5 per ton. All descriptions are well inquired for, but supplies are easier to procure as a result of the scrap campaign, although the demand is still ahead of the available tonnage. Firm quotations are being maintained in all districts.

Metals

Copper.—Buying on industrial account is not heavy, but consumption is reported to be well maintained. Both Russia and Japan have recently been in the market for heavy tonnages. Business in the United States has been quiet. It is reported that copper production in Chile is on a record level.

Metal Exchange quotations were as follow :—

Cash.—Thursday, £55 12s. 6d. to £55 15s.; Friday, £55 12s. 6d. to £55 13s. 9d.; Monday, £55 3s. 9d. to £55 6s. 3d.; Tuesday, £54 18s. 9d. to £55; Wednesday, £54 11s. 3d. to £54 12s. 6d.

Three Months.—Thursday, £55 13s. 9d. to £55 15s.; Friday, £55 13s. 9d. to £55 15s.; Monday, £55 6s. 3d. to £55 7s. 6d.; Tuesday, £55 to £55 1s. 3d.; Wednesday, £54 12s. 6d. to £54 13s. 9d.

Tin.—At a meeting of the International Tin Committee in Paris on Thursday last it was decided to make no change in the present export quota of 110 per cent. The next meeting of the Committee will be held on December 10 in London. In their weekly review of the metal markets, Rudolf Wolff & Company state that "trade demand has been quiet, both in this country and on the Continent, but rather more activity has been reported from time to time in the United States. On the London market, business has been on a rather reduced scale and prices have fluctuated nervously under the influence of the moment. Confidence has been disturbed by the conflict in the Far East and the unsettled political situation in Europe, while the heavy decline on the stock markets in America has also been a depressing influence."

Official quotations were as follow :—

Cash.—Thursday, £261 10s. to £261 15s.; Friday, £263 5s. to £263 10s.; Monday, £264 5s. to £264 10s.; Tuesday, £264 to £264 10s.; Wednesday, £264 7s. 6d. to £264 12s. 6d.

Three Months.—Thursday, £260 5s. to £260 10s.; Friday, £262 5s. to £262 10s.; Monday, £263 10s. to £263 15s.; Tuesday, £263 10s. to £263 15s.; Wednesday, £263 15s. to £264.

Spelter.—Owing to the unsettled international situation, consumers have preferred to keep out of the market, and business has been on a reduced scale. Trade in the United States, also, has been quieter.

Daily market prices :—

Ordinary. — Thursday, £22 15s.; Friday, £22 16s. 3d.; Monday, £22 8s. 9d.; Tuesday, £22; Wednesday, £21 17s. 6d.

Lead.—A strong tone continues to prevail in this market, and a keen demand is being experienced both at home and abroad. New inquiries in the United States are rather less at the present time, but consumers generally are well booked for supplies.

Day-to-day quotations :—

Soft Foreign (Prompt).—Thursday, £22; Friday, £21 17s. 6d.; Monday, £21 10s.; Tuesday, £21 5s.; Wednesday, £21 2s. 6d.

Scrap.—There has been some indication of an expansion in demand recently, and a steady increase is now to be expected. Prices have advanced.

Approximate selling prices for old metal :—New aluminium cuttings, £82; rolled, £67; cast, £41; foil, £94 to £98. Copper, £52 to £56; braziery, £48 to £50. Brass (clean), £31 to £33. Zinc, £16. Lead, £21. Gunmetal, £50 to £53.

GRAVENTURI

(PATENT APPLIED FOR)

THE NEW SANDBLAST SYSTEM

When, 1st April, we announced our entry into Sand Blast manufacture, we promised that new and properly trained minds would evolve new and better ideas. This we have done, and despite a full order book, we have made time to produce and test the first of our new machines, the Graventuri, Model 2. The model is a 2-foot square cabinet, with fixed nozzle for light work, fitted with motor and exhauster as an integral part at £30, f.o.r., London.

Air compressor and receiver are extra, but as Graventuri ensures sweeping reductions in air consumption, and as pressures can be lower due to maximum exploitation of kinetic energy, motor and compressor prime and maintenance costs are a fraction of those normally provided for.

For full particulars apply to—

Telephone: Terminus 4898.

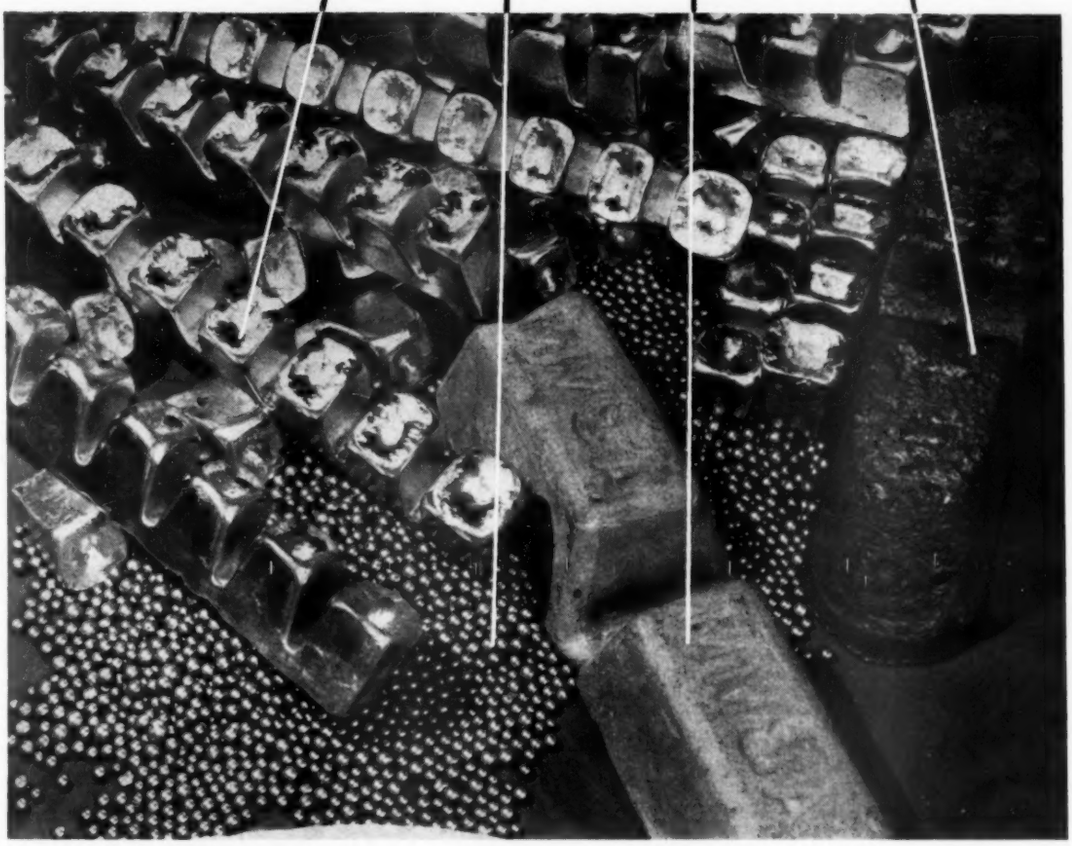
H. G. SOMMERFIELD, Ltd.

7, TAVISTOCK PLACE, LONDON, W.C.1

or at STAND 14, ROW A, OLYMPIA

Telegrams: Inland: Norswedan, Kincross, London.

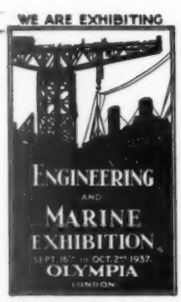
Al + Ni + Mg + Cu



+ Scientific Control

= B.A."Y" ALLOY

The technique of alloying calls for specialized metallurgical experience, and the attainment of uniformity is easier and more certain in the case of large industrial melts than in the small crucibles of the foundry. For these reasons small foundries should buy their alloys ready mixed. All the B.S.S. alloys and many other alloys for special purposes, mixed under the best possible conditions and using the best virgin metals, are supplied by the British Aluminium Co., Ltd.



Stand No. 19C
(Gallery)

THE British Aluminium CO. LTD

HEAD OFFICE: ADELAIDE HOUSE, LONDON, E.C.4.

Telephone: Mansion House 5561 (6 lines). Telegrams: "Cryolite, London."

RAW MATERIALS—PRICE LIST

(Wednesday, September 15, 1937)

COPPER

	£	s.	d.
Standard cash	54	11	3
Three months	54	12	6
Electrolytic	61	0	0
Tough	60	15	0
Best selected	61	5	0
Sheets	93	0	0
India	73	5	0
Wire bars	62	10	0
Ingot bars	62	10	0
H.C. wire rods	66	0	0
Off. av. cash, August	57	3	10 1/4
Do., 3 mths., August	57	7	1 1/2
Do., Sttlmnt., August	57	3	9 1/2
Do., Electro, August	64	1	8
Do., B.S., August	63	16	4 3/4
Do., wire bars, August	64	11	5 1/2
Solid drawn tubes			14d.
Brazed tubes			14d.
Wire			9 1/2d.

BRASS

Solid drawn tubes	12 1/2d.
Brazed tubes	14 1/2d.
Rods, drawn	11 1/2d.
Rods, extd. or rlld.	7 1/2d.
Sheets to 10 w.g.	10 1/2d.
Wire	9 1/2d.
Rolled metal	9 3/4d.
Yellow metal rods	7 1/2d.

TIN

	£	s.	d.
Standard cash	264	7	6
Three months	263	15	0
English	264	7	6
Bars	266	0	0
Straits	269	0	0
Eastern	267	15	0
Banca (nom.)		—	
Off. av. cash, August	264	15	1 3/4
Do., 3 mths., August	263	0	10 1/2
Do., Sttlmt., August	264	15	5 1/2

SPELTER

	£	s.	d.
Ordinary	21	17	6
Remelted	19	0	0
Hard	18	0	0
Electro, 99.9	24	12	6
English	23	0	0
India	19	0	0
Zinc dust	29	0	0
Zinc ashes	7	10	0
Off. aver., August	24	4	3 17/32
Aver. spot, August	24	2	9 1/2

LEAD

	£	s.	d.
Soft foreign, ppt.	21	2	6
Empire (nom.)	22	1	3
English	23	5	0
Off. aver., August	22	12	9 3/32
Aver. spot, August	22	12	1 7/16

ALUMINIUM

Ingots	£100 to £105
Wire	1/3 to 1/4 lb.
Sheet and foil	1/2 to 1/4 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	36 10 0 to 37	0	0
Do., V.M. ex-whse.	36 10 0 to 37	0	0
Rods	30	15	0

ANTIMONY

	£	s.	d.
English	92 10 0 to 93	10	0
Chinese, ex-whse. (nom.)	81	0	0
Crude, c.i.f.	45	0	0

QUICKSILVER

	£	s.	d.
Quicksilver	13	12	3

FERRO-ALLOYS AND STEEL-MAKING METALS

Ferro-silicon—	
25%	£14 10 0
45/50%	£12 0 0
75%	£17 0 0
Ferro-vanadium—	
35/50%	12/8 lb. Va
Ferro-molybdenum—	
70/75% carbon-free	4/9 lb. Mo.
Ferro-titanium—	
20/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£21 to £22
Ferro-tungsten—	
80/85%	9/- lb.
Tungsten metal powder—	
98/99%	9/3 lb.
Ferro-chrome—	
2/4% car.	£34 15 0
4/6% car.	£24 5 0
6/8% car.	£24 0 0
8/10% car.	£24 0 0
Ferro-chrome—	
Max. 2% car.	£36 0 0
Max. 1% car.	£38 5 0
Max. 0.5% car.	£41 0 0
70% carbon-free	10d. lb.
Nickel—99.5/100%	£180 to £185
"F" nickel shot	£165 0 0
Ferro-cobalt, 98/99%	8/6 to 8/9 lb.
Metallic chromium—	
96/98%	2/5 lb.
Ferro-manganese—	
76/80% loose	£18 15 0 to 19 5 0
76/80% packed	£19 15 0 to 20 5 0
76/80% export	£22 0 0
Metallic manganese—	
94/96% carbon-free	1/3 lb.

Per ton unless otherwise stated, basis 2-ton lots.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten 3s. 3d.
Finished bars, 18% tungsten 4s. 0d.
Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under 1/2 in. to 1/4 in.	3d. lb.
Do., under 1/4 in. to 1/16 in.	1/- lb.
Flats, 1/4 in. × 1/4 in. to under 1 in. × 1/4 in.	3d. lb.
Do., under 1/4 in. × 1/4 in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

South Wales (West)	£	s.	d.	£	s.	d.
Heavy steel, best	3	7	6 to	3	10	0
Mixed iron and steel	3	5	0 to	3	7	6
Heavy cast iron	3	7	6 to	3	10	0
Good machinery				4	0	0

Cleveland—						
Heavy steel, best	3	6	6 to	3	9	0
Steel turnings				2	15	0
Heavy cast iron				4	7	6
Heavy machinery				4	10	0

Midlands—						
Short heavy steel	3	17	6 to	4	0	0
Light cast-iron scrap				3	2	6
Heavy wrought iron	4	0	0 to	4	5	0
Steel turnings	2	2	6 to	2	5	0

Scotland—						
Heavy steel, best	3	4	6 to	3	7	0
Ordinary cast iron				4	5	0
Cast-iron borings	2	0	0 to	2	2	6
Wrot-iron piling	4	16	0 to	4	17	6
Heavy machinery	4	13	6 to	4	15	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	47	0	0
Brass	30	0	0
Lead (less usual draft)	18	10	0
Tea lead	15	0	0
Zinc	15	0	0
New aluminium cuttings	71	0	0
Braziery copper	43	0	0
Gunmetal	45	0	0
Hollow pewter	170	0	0
Shaped black pewter	125	0	0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	103/6
,, No. 3	101/-
,, No. 4	100/-
Forge No. 4	100/-
Hematite No. 1	123/-*
Hematite M/Nos.	122/6*
N.W. Coast—	
Hem. M/Nos. d/d Glas.	123/-*
,, d/d Birm.	134/6*
Malleable iron d/d Birm.	160/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	103/-
,, No. 3 fdry.	106/-
Northants forge	100/6
,, fdry. No. 3	103/6
,, fdry. No. 1	106/6
Derbyshire forge	103/-
,, fdry. No. 3	106/-
,, fdry. No. 1	109/-
Scotland—	
Foundry, No. 1, f.o.t.	115/6
,, No. 3, f.o.t.	113/-
Cleveland No. 3, Glasgow	107/-
,, ,, Falkirk	104/-
Scottish hem. M/Nos. d/d	123/-*
Sheffield (d/d district)—	
Derby forge	100/6
,, fdry. No. 3	103/6
Lincs forge	100/6
,, fdry. No. 3	103/6
W.C. hematite	128/6*
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	109/-
Staffs fdry. No. 3	109/-
Northants fdry. No. 3	107/6
Cleveland fdry. No. 3	109/-
Glengarnock, No. 3	137/6
Clyde, No. 3	137/6
Monkland, No. 3	137/6
Summerlee, No. 3	137/6
Eglinton, No. 3	137/6
Gartsherrie, No. 3	137/6
Shotts, No. 3	137/6

* Subject to a rebate of 5s. per ton under certain conditions.

FINISHED IRON AND STEEL

Usual district deliveries.

[A rebate of 15/- per ton for steel sections, plates and joists is obtainable in the home trade under certain conditions.]

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	13	5	0 to	13	15	0
Nut and bolt iron	11	12	6 to	12	2	6
Hoops				14	2	6
Marked bars (Staffs) f.o.t.				15	15	0
Gas strip				14	2	6
Bolts and nuts, 1/4 in. × 4 in.				17	10	0 and up.

Steel—						
Plates, ship, etc.	11	8	0 to	11	10	6
Boiler plts.	11	18	0 to	12	0	6
Chequer plts.				13	0	6
Angles				11	0	6
Tees				12	0	6
Joists				11	0	6
Rounds and squares, 3 in. to 5 1/2 in.				12	0	6
Rounds under 3 in. to 1/4 in. (Untested)				11	9	0
Flats—8 in. wide and over				11	5	6
,, under 8 in. and over 5 in.				11	10	6
Rails, heavy				10	2	6
Fishplates				14	2	6
Hoops (Staffs)				12	4	0
Black sheets, 24g. (4-t. lots)				15	15	0
Galv. cor. shts. (,,)				19	10	0
Galv. flat shts. (,,)				20	0	0
Galv. fencing wire, 8g. plain				20	5	0
Billets, soft, 100-ton lots				7	17	6
Sheet bars				7	15	0
Tin bars				7	15	0

PHOSPHOR BRONZE

	Per lb. basis
Strip	13d.
Sheet to 10 w.g.	13 1/2d.
Wire	15d.
Rods	16d.
Tubes	20 1/2d.
Castings	16d.

Delivery 3 cwt. free.
10% phos. cop. £33 above B.S.
15% phos. cop £38 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	9d. to 1/3
Rolled—	
To 9 in. wide	1/3 to 1/9
To 12 in. wide	1/3 1/2 to 1/9 1/2
To 15 in. wide	1/3 1/2 to 1/9 1/2
To 18 in. wide	1/4 to 1/10
To 21 in. wide	1/4 1/2 to 1/10 1/2
To 25 in. wide	1/5 to 1/11
Ingots for spoons and forks	9d. to 1/5 1/2
Ingots rolled to spoon size	1/- to 1/8 1/2
Wire round—	
to 10g.	1/6 1/2 to 2/1 1/2

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/5 1/2 upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	25.76
No. 2 foundry, Valley	24.00
No. 2 foundry, Birm.	20.38
Basic, Valley	23.50
Malleable, Valley	24.00
Grey forge, Valley	23.50
Ferro-mang. 80%, seaboard	102.50
O.-h. rails, h'y, at mill	42.50
Billets	37.00
Sheet bars	37.00
Wire rods	47.00
	Cents.
Iron bars, Chicago	2.40
Steel bars	2.45
Tank plates	2.25
Beams, etc.	2.25
Skelp, grooved steel	2.10
Steel hoops	2.40
Sheets, black, No. 24	3.15
Sheets, galv., No. 24	3.80
Wire nails	2.75
Plain wire	2.90
Barbed wire, galv.	3.40
Tinplates, 100-lb box	$5.35

COKE (at ovens)

Welsh foundry	42/6
,, furnace	37/6
Durham foundry	36/6
,, furnace	35/6
Scottish foundry	42/6
,, furnace	40/-

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	25/6 to 26/-
,,	28×20 ,,	51/- to 52/-
,,	20×10 ,,	36/6 to 36/9
,,	18 3/4×14 ,,	26/3 to 26/6
C.W.	20×14 ,,	22/6 to 23/-
,,	28×20 ,,	46/- to 46/6
,,	20×10 ,,	32/- to 32/6
,,	18 3/4×14 ,,	23/- to 23/6

SWEDISH CHARCOAL IRON & STEEL

	£	s.	d.	£	s.	d.
Pig-iron	£12	0	0 to	£13	0	0
Bars-hammered, basis	£20	0	0 to	£22	0	0
Bars and nail-rods, rolled, basis	£19	0	0 to	£20	0	0
Blooms	£16	0	0 to	£17	0	0
Keg steel	£30	0	0 to	£35	0	0
Faggot steel	£20	0	0 to	£25	0	0
Bars and rods dead soft st'l	£19	0	0 to	£20	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 19.39 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

		£	s.	d.	
Sept.	9 ..	55	12	6	dec. 18/9
,,	10 ..	55	12	6	No change
,,	13 ..	55	3	9	dec. 8/9
,,	14 ..	54	18	9	,, 5/-
,,	15 ..	54	11	3	,, 7/6

Electrolytic Copper

		£	s.	d.	
Sept.	9 ..	61	15	0	dec. 10/-
,,	10 ..	62	0	0	inc. 5/-
,,	13 ..	62	0	0	No change
,,	14 ..	62	0	0	,, ,,
,,	15 ..	61	0	0	dec. 20/-

Standard Tin (cash)

		£	s.	d.	
Sept.	9 ..	261	10	0	inc. 20/-
,,	10 ..	263	5	0	,, 35/-
,,	13 ..	264	5	0	,, 20/-
,,	14 ..	264	0	0	dec. 5/-
,,	15 ..	264	7	6	inc. 7/6

Tin (English ingots)

		£	s.	d.	
Sept.	9 ..	261	10	0	inc. 20/-
,,	10 ..	263	5	0	,, 35/-
,,	13 ..	264	5	0	,, 20/-
,,	14 ..	264	0	0	dec. 5/-
,,	15 ..	264	7	6	inc. 7/6

Spelter (ordinary)

		£	s.	d.	
Sept.	9 ..	22	15	0	dec. 8/9
,,	10 ..	22	16	3	inc. 1/3
,,	13 ..	22	8	9	dec. 7/6
,,	14 ..	22	0	0	,, 8/9
,,	15 ..	21	17	6	,, 2/6

Spelter (Electro, 99.9 per cent.)

		£	s.	d.	
Sept.	9 ..	25	7	6	dec. 8/9
,,	10 ..	25	10	0	inc. 2/6
,,	13 ..	25	2	6	dec. 7/6
,,	14 ..	24	15	0	,, 7/6
,,	15 ..	24	12	6	,, 2/6

Lead (soft foreign, prompt)

		£	s.	d.	
Sept.	9 ..	22	0	0	dec. 6/3
,,	10 ..	21	17	6	,, 2/6
,,	13 ..	21	10	0	,, 7/6
,,	14 ..	21	5	0	,, 5/-
,,	15 ..	21	2	6	,, 2/6

Lead (English)

		£	s.	d.	
Sept.	9 ..	24	5	0	dec. 5/-
,,	10 ..	24	0	0	,, 5/-
,,	13 ..	23	10	0	,, 10/-
,,	14 ..	23	5	0	,, 5/-
,,	15 ..	23	5	0	No change

A COMPARISON OF SCRAP PRICES

Average Monthly Prices of Cast-Iron Scrap in the Principal Districts in the Years 1931–37

SCOTLAND (Heavy Machinery)—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
1931	£ s. d. 2 15 0	£ s. d. 2 15 0	£ s. d. 2 13 3	£ s. d. 2 10 8	£ s. d. 2 9 9	£ s. d. 2 8 3	£ s. d. 2 8 6	£ s. d. 2 7 9	£ s. d. 2 5 6	£ s. d. 2 9 8	£ s. d. 2 14 5	£ s. d. 2 15 9	£ s. d. 2 11 2
1932	2 15 0	2 15 0	2 12 6	2 10 6	2 7 6	2 5 3	2 4 5	2 3 10	2 4 10	2 4 4	2 4 0	2 4 8	2 7 8
1933	2 7 0	2 9 3	2 10 8	2 10 5	2 9 5	2 9 3	2 8 6	2 10 9	2 10 4	2 10 7	2 10 10	2 12 4	2 9 11
1934	2 14 2	2 17 9	2 18 5	2 18 3	2 15 5	2 15 9	2 14 3	2 15 0	2 15 9	2 15 0	2 15 8	2 16 3	2 16 0
1935	2 15 5	2 15 8	2 15 10	2 16 4	2 16 10	2 17 0	2 16 9	2 16 9	2 17 0	2 16 11	2 19 11	3 2 7	2 17 5
1936	3 4 8	3 9 10	3 10 11	3 11 10	3 10 8	3 9 10	3 9 2	3 8 9	3 8 11	3 9 2	3 10 0	3 13 3	3 9 9
1937	3 15 0	4 2 10	4 6 2	4 9 9	4 14 9	4 15 0	4 15 0	4 15 0	—	—	—	—	—

N.E. COAST (Heavy Qualities)—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
1931	£ s. d. 2 10 4	£ s. d. 3 9 8	£ s. d. 2 9 7	£ s. d. 2 8 3	£ s. d. 2 6 3	£ s. d. 2 3 8	£ s. d. 2 2 9	£ s. d. 2 1 9	£ s. d. 2 1 0	£ s. d. 2 2 1	£ s. d. 2 9 9	£ s. d. 2 6 6	£ s. d. 2 5 11
1932	2 6 3	2 5 8	2 3 0	2 0 8	1 19 0	2 1 0	1 15 9	1 15 6	1 15 6	1 15 6	1 17 4	1 19 10	1 19 7
1933	2 1 1	2 2 2	2 4 9	2 3 5	1 18 9	1 19 6	2 0 0	2 0 0	2 1 3	2 5 8	2 7 10	2 10 1	2 5 4
1934	2 12 7	2 15 1	2 13 7	2 11 6	2 11 11	2 13 9	2 11 0	2 10 6	2 11 3	2 11 10	2 13 9	2 13 3	2 12 4
1935	2 12 2	2 13 0	2 12 7	2 13 0	2 12 9	2 12 6	2 12 6	2 12 6	2 12 6	2 12 6	2 12 6	2 16 10	2 12 10
1936	3 0 0	3 1 10	3 1 8	3 2 2	3 4 6	3 3 9	3 5 9	3 4 1	3 5 11	3 6 3	3 6 3	3 7 10	3 4 2
1937	3 10 6	3 14 9	4 2 6	4 3 9	4 6 3	4 7 6	4 7 6	4 7 6	—	—	—	—	—

S. WALES (Heavy Cast Iron)—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
1931	£ s. d. 2 7 7	£ s. d. 2 8 3	£ s. d. 2 9 9	£ s. d. 2 8 1	£ s. d. 2 6 11	£ s. d. 2 5 2	£ s. d. 2 2 9	£ s. d. 2 2 2	£ s. d. 2 0 11	£ s. d. 2 3 9	£ s. d. 2 7 6	£ s. d. 2 7 10	£ s. d. 2 5 9
1932	2 7 2	2 6 8	2 6 4	2 5 0	2 4 8	2 0 8	1 19 4	2 1 7	2 1 10	1 18 10	1 19 8	2 2 1	2 2 0
1933	2 3 4	2 4 6	2 4 6	2 4 1	2 3 5	2 2 8	2 3 7	2 4 8	2 5 8	2 5 9	2 5 7	2 5 0	2 4 5
1934	2 6 10	2 8 9	2 7 8	2 6 6	2 7 6	2 8 0	2 6 10	2 6 7	2 8 0	2 8 2	2 9 1	2 11 5	2 7 1
1935	2 11 3	2 11 4	2 11 1	2 11 3	2 12 0	2 11 1	2 11 1	2 11 0	2 12 2	2 13 10	2 14 5	2 14 8	2 11 9
1936	2 16 3	2 18 7	2 18 9	2 19 2	2 18 7	2 18 7	2 19 0	2 19 0	2 18 9	2 19 0	2 19 2	2 19 0	2 18 8
1937	3 4 1	3 9 8	3 9 3	3 9 0	3 9 0	3 9 0	3 9 0	3 9 0	—	—	—	—	—

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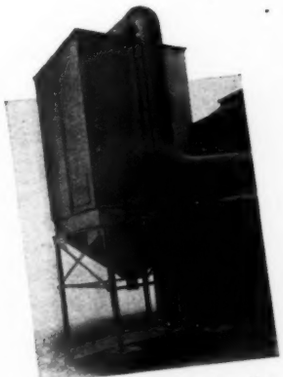

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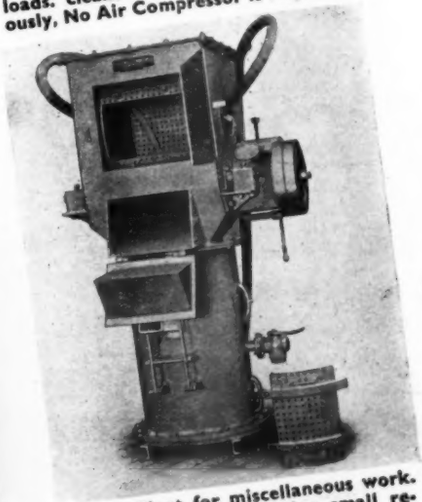

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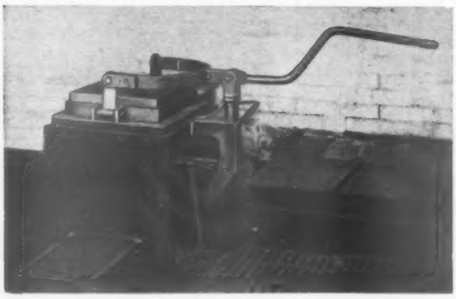

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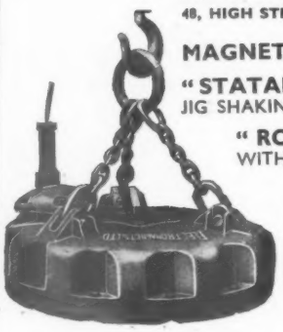

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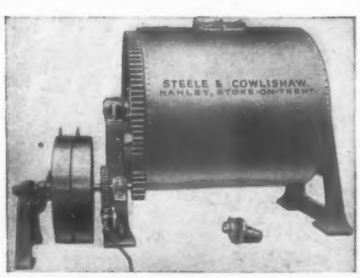

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